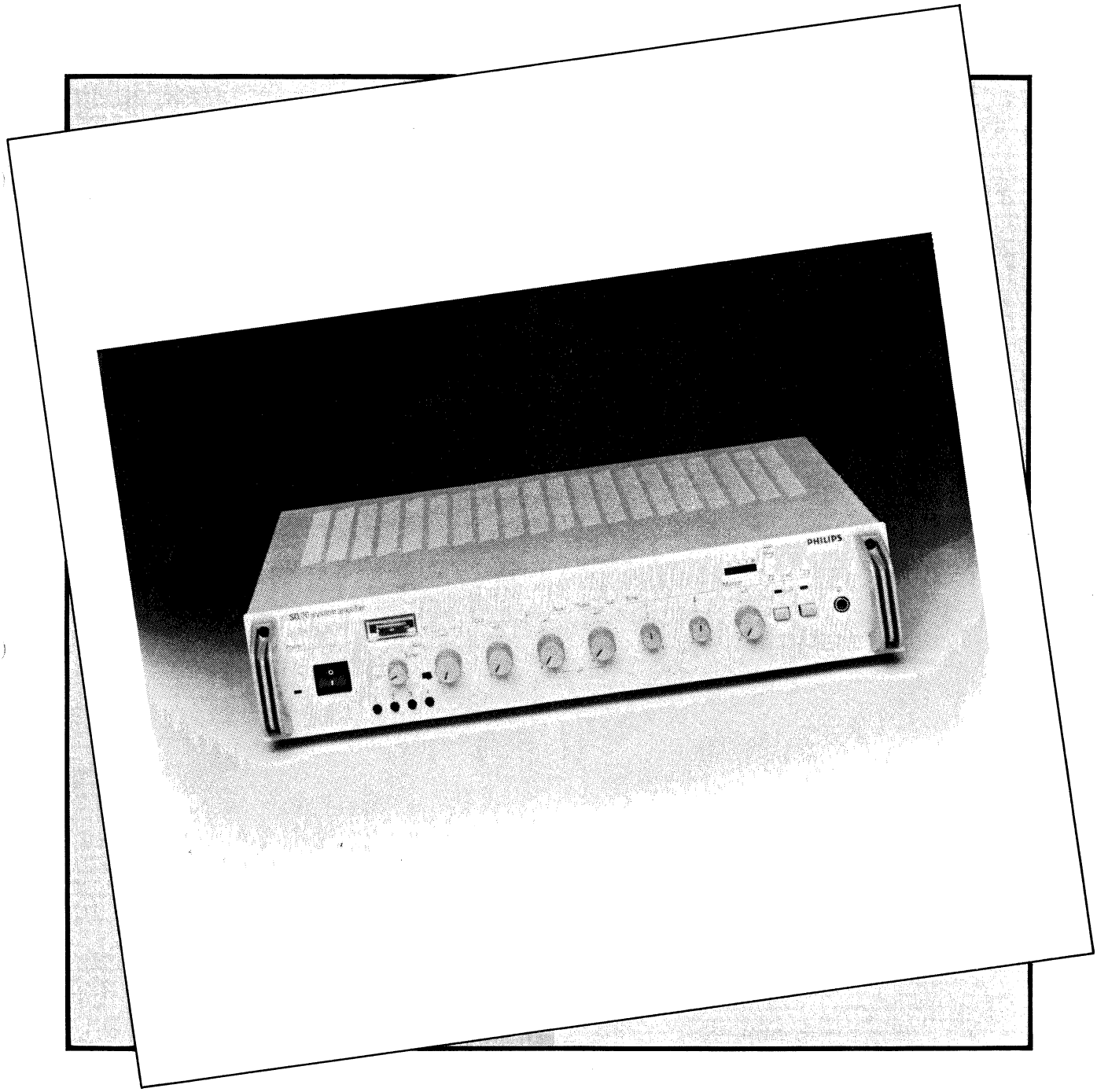
PHILIPS

SQ 20 AMPLIFIER - RANGE

Service Manual



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CUSTOMER SUPPORT

Service I.P.G. Prof. Audio
Public Address Systems
Industrial & Electro-acoustic Systems Division
Nederlandse Philips Bedrijven B.V.

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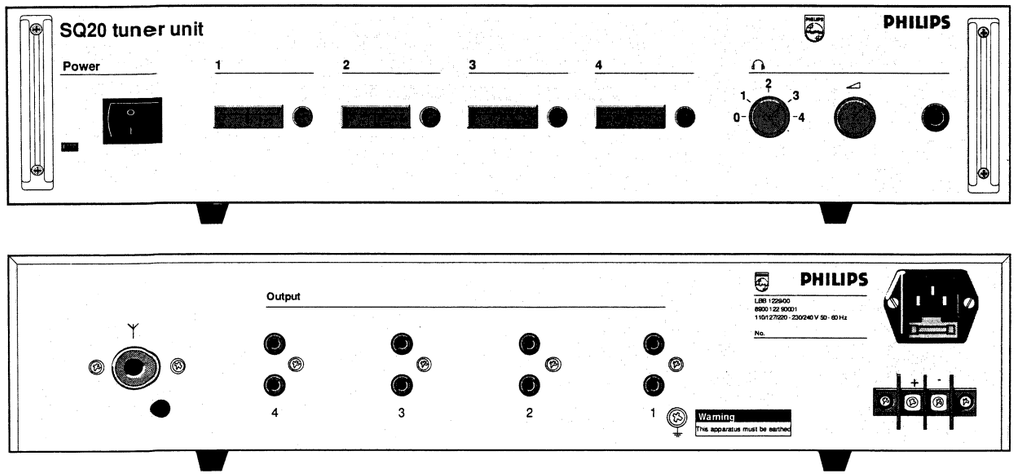
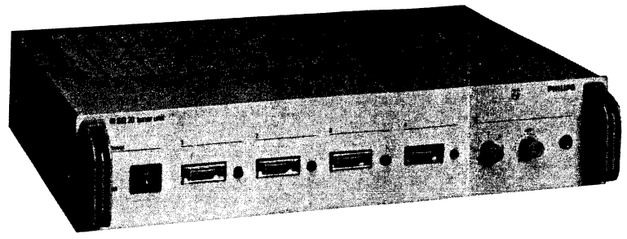


SQ 20 tuner unit (LBB 1229/00)

SQ 20 Tuner unit LBB 1229/00

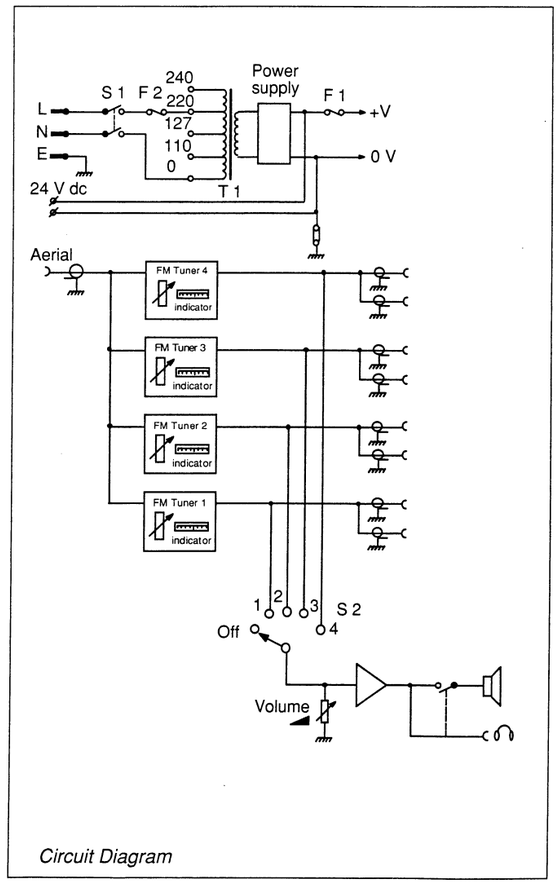


- **Contains four individual FM tuners.**
- **Tuning range from 87.5 to 108 MHz.**
- **Suitable for table-top or 19" rack mounting.**
- **Matches SQ 20 amplifier series cabinets.**
- **Built-in monitor loudspeaker with volume control.**
- **Complies with international installation and safety regulations.**

Technical data

Mains supply	110, 127, 220 V ±10% and 230, 240 V +6/-10% 50 or 60 Hz
At delivery DC supply	220-230 V +24 V -10/+20% (0 V grounded)
Power consumption	20 VA
Outputs	
Headphone output	
- *output signal*	3 V
- *output impedance*	68 Ω
Tuner outputs (4)	
- *output signal*	1 V ±1 dB
- *output impedance*	< 200 Ω
FM tuner unit	
- *frequency range*	87.5 to108 MHz
- *frequency response*	40 Hz to12 kHz ±2 dB
sensitivity	<= 4 µV at 26 dB signal-to-noise ratio and 75 kHz deviation
- *signal-to-noise ratio at 40 kHz*	>= 55 dB
- *aerial impedance*	75 Ω
Environmental conditions	
- *ambient temperature*	rated range -10 to +45 °C
- *storage temperature range*	-40 to +70°C
- *relative humidity*	< 95%
Dimensions	
- *height*	88 mm (100 mm including feet)
- *width*	440 mm (483 mm including 19" mounting brackets)
- *depth*	308 mm (348 mm including handles)
Weight	6 kg
Safety	according to IEC 65 and BS415

This product is manufactured to comply with the radio interference requirements of the Council Directive of 87/308/EEC.



Circuit Diagram

The Philips SQ 20 range of high-performance audio amplifiers and compatible system accessories has been designed to meet the most demanding professional public address requirements.

SQ 20 tuner unit
The LBB 1229/00 tuner unit contains four separate FM-tuners, and is an ideal music source for hospital and hotel public address systems offering a choice of channels to each individual listener. Each tuner can be independently tuned over the full FM range (87.5 to 108 MHz) and has a tuning indicator calibrated in MHz and preset potentiometer tuning knob mounted on the front panel.

The output sockets are mounted on the rear panel, (two cinch sockets per tuner, although the output signal is mono), and a coaxial aerial socket is also included. Four screened stereo cables, each 1.5 m long and terminated at both ends with one red and one black cinch connector, are supplied with the tuner unit for connecting outputs to a suitable booster amplifer.

Monitor loudspeaker
A built-in monitor loudspeaker with volume control is provided on the front panel. A five-position switch is included to monitor each tuner in turn using the loudspeaker or via a headphone (a socket is provided which automatically disconnects the loudspeaker when the headphone is inserted). The monitor loudspeaker can also be used to provide music for the area where the system is installed, such as in a hotel reception.

Mains supply
The tuner unit can be connected to 110, 127, 220-230 or 240 V supplies (at 50 or 60 Hz) as the mains transformer has taps on the primary winding to allow for different line voltages. The transformer is thermally fused to prevent overheating. It is supplied wired for 220 V operation, and changes are made by resoldering the connections to the appropriate transformer tags. The tuner unit can also be powered from a 24 V DC source. Both the mains and the DC supplies are fused. A 2 m long mains cable terminated at one end with an CEE plug and at the other with an earthed 2-pin mains plug is supplied.

Mounting
Suitable for either table-top or 19" rack mounting, the tuner unit is housed in a SQ 20 cabinet that matches all other elements in the range. The cabinet has non-corrosive anti-skid feet fitted. For rack mounting, the cover plate and feet must be removed and the unit is secured using two special mounting flanges (LBB 1239/00 - not supplied).

Safety
In common with all Philips products, care is taken to meet high safety standards. The SQ 20 tuner unit complies with the relevant safety and installation regulations of IEC 65 and BS 415.

FIGURE 2.1
LBB 1229

This socket is also available for connecting other additional auxiliary equipment, such as a graphic equaliser.

.ll microphone channel input connectors including the interconnection socket are 5-pole 180° DIN-type sockets, mounted on the amplifiers rear panel.

Six double cinch type sockets also mounted on the amplifiers rear panel, provide the five, line level inputs, and tape/ cassette recorder output connections.

The outputs of the amplifiers, feeding their respective loud-speakers or groups of loudspeakers (not applicable to pre-mixing amplifier LBB 1230) are provided via an 'in-built' loudspeaker matching transformer.

The transformer provides a choice of three line level output voltages, ?V, 70V, 100V, this means that .arge groups of loudspeakers, covering long distances may be connected. An advantage of such an in-built facility is that the volume level of each loudspeaker, or groups of loudspeakers may be set individually.

Also included is an 8 Ohm low impedance output, this allows greater flexibility when choosing low ohmic loudspeakers.

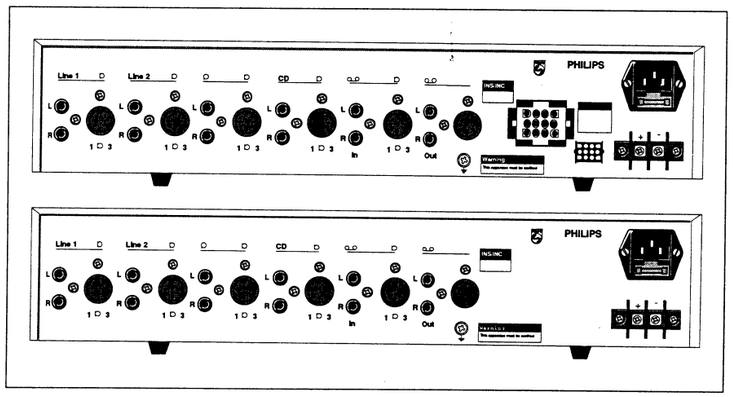
The loudspeaker matching trans-former's outputs are fed to their respective loudspeakers via a 'Mate-N-Lok' connector positioned at the rear of the amplifier, thus providing simpli-city in connecting loudspeakers.
The front panel of the amplifiers contains easy to use rotary controls for the input sensitivity of each channel, and for both bass and treble tone adjustment of the amplified output signal. A master volume control, controls the overall gain level of the amplifier.

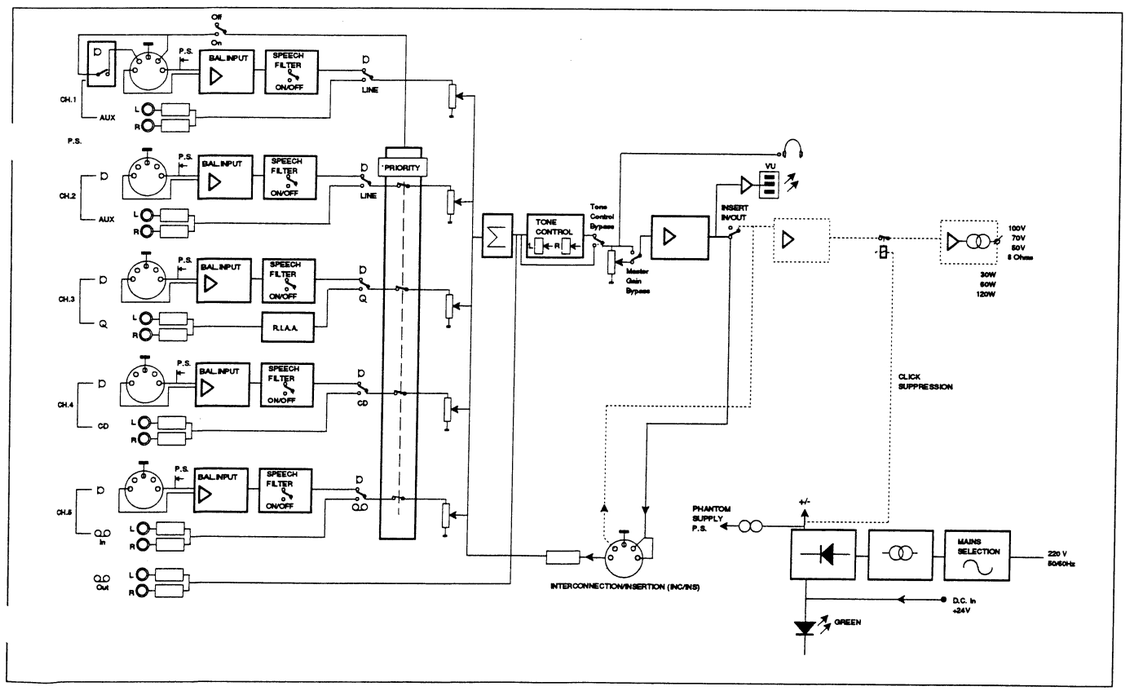
A front panel LED, located in close proximity to the mains switch, illuminates when the amplifier is powered up.

Indications for monitoring the amplifiers output power are provided by front panel mounted LED's.

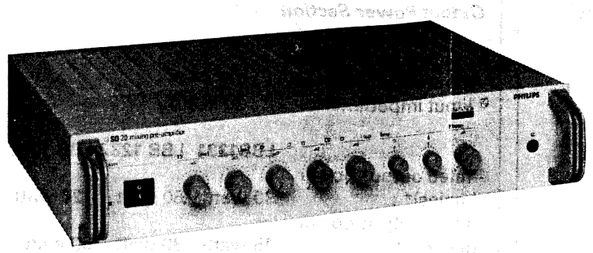
The mains transformer may be tapped for different a.c mains voltages of 110V, 127V, 220-230V and 240V.

On delivery all amplifiers are supplied with a 2 m long mains lead terminated at one end with a 2-pole mains plug with earth contacts, and at the other end with a C.E.E mains connector.





SQ 20
Mixing and Pre-Mixing Amplifiers



- **P.A. amplifiers for table-top and 19" rack mounting.**
- **Balanced phantom supply audio inputs .**
- **In-built matching transformer for loudspeakers with 100 V, 70 V, 50 V and 8 Ohm low ohmic tappings.**
- **Emergency external battery supply facility.**
- **Built-in monitoring facility with VU meter and headphone.**

The ***SQ20*** range of stand-alone public address ***'high performance audio mixing, and pre-mixing am-plifiers'*** has been designed to fulfil most professional public ad-dress requirements.

Due to their architectural design and high degree of versatility, they complement any tailored P.A. sys-tem; making them ideal for multi-zone projects requiring amplifica-tion for a variety of audio signals, simultaneously.

Ease of installation, together with excellent ***'reliability'*** and service 'accessibility', have been optimized in their design.

The **SQ20** range of mixing and pre-mixing amplifiers is available in a 30 watt, 60 watt, and 120 watt version, each offering its own advantage in fulfilling a variety of application needs.

The comprehensive range of **SQ20** mixing and pre-mixing amplifiers are available with the following type numbers :

- **LBB 1230/00** Pre-Mixing
- **LBB 1231/00** Mixing (30 watt)
- **LBB 1232/00** Mixing (60 watt)
- **LBB 1233/00** Mixing (120 watt)

Each amplifier includes ***'five input channels'***, each channel can be pre-selected by means of internally mounted switches for use as ***'microphone or line inputs'***.
When used as microphone inputs, phantom power is available, thus allowing connection of both Philips dynamic and BPE electret microphones.
When used as ***'line level'*** inputs, a variety of sound sources such as a tape or cassette recorder, tuner, compact disc player, or for a magneto-dynamic input such as a record player.

An additional feature included in the range of mixing and pre-mixing amplifiers is the option of selecting a ***'priority microphone channel'*** . This feature, which when used with certain Philips microphones including a "priority" switch, allows an announcer to take priority, and mute all other sound sources currently being amplified.

An 'In-built' ***'speech-filter'*** facility, selectable on all five channels, reduces the bass content of the amplified signal, thus allowing announcements and paging calls to be heard with greater clarity.

An ***'Interconnection / Insertion'*** socket allows other SQ20 mixing, pre-mixing and booster amplifiers to be connected should requirements change and the system needs to be expanded.

FIGURE 2.2
LBB 1230 - LBB 1232

TECHNICAL DATA
(applicable to all amplifers unless otherwise stated)

Mains supply : 110, 127, 220 V +/- 10%,
230 V & 240 V +6/-10% 50/60 Hz
The amplifier is delivered connected for 220 - 230 Volts A.C.

Battery supply : + 24 V, (0 V grounded)
deviation -10 to +20%

Power Consumption : **LBB 1230** : 11 VA
LBB 1231 : 110 VA
LBB 1232 : 176 VA
LBB 1233 : 352 VA

Mixer Amplifier
Pre - amp. section :

Microphone ***(Channel 1-2-3-4-5) :***
- balanced input with phantom supply : 12 V
- input sensitivity : 1.5mV
- input impedance : 1360 Ohm
- max.overload with 2% distortion : 25 dB
Priority channel 1, over channels 2 to 5

AUX. ***(Channel 1-2)***
- input sensitivity : 120 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 20 dB

Phono RIAA ***(Channel 3)***
- input sensitivity : 2.5 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 10 dB

C.D. ***(Channel 4)***
- input sensitivity : 360 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 15 dB

Tape In ***(Channel 5)***
- input sensitivity : 120 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 20 dB

Insertion
- input sensitivity : 1 V
- input impedance : > 20 kOhm

Outputs:

Headphone
- output signal : 3 V
- output impedance : 68 Ohm

Interconnection/Insert
- output signal : 1 V
- output impedance : < 200 Ohm
- output short circuit protected

Tape Out
- output signal : 500 mV
- output impedance : 3.3 kOhm

Frequency Response : 60 Hz to 18 kHz
(+1 to -3 dB)
- speech filter response : -3 dB at 315 Hz
(slope 6 dB/octave)

Distortion
- total harmonic distortion at rated
output voltage : < 0.5% (1 kHz)

Tone Controls
- bass control : +/- 10 dB, at 100 Hz
- treble control : +/- 10 dB, at 10 kHz

Signal/noise ratio :
measured with microphone input terminated with 200 Ohm resistor, phono input with 2 kOhm, AUX, tape and CD input with 2 kOhm:
- master volume control max. and all
volume control min. : 70 dB
- microphone control max. : 60 dB
- phono : 50 dB
- tape in : 60 dB
- CD : 60 dB
(measured between 20 Hz and 20 kHz flat)

Output Power Section

Interconnection/Insert
- input sensitivity : 1 V
- input impedance: : 20 kOhm

	LBB1231	**LBB 1232**	**LBB 1233**
- rated output power (mains)* :	30 watt	60 watt	120 watt
- rated output power (battery)* :	15 watt	30 watt	60 watt

*) acc. IEC 268

Frequency Response:
- measured at 10 dB
below rated output power : within +1 to -3 dB between 60 Hz and 18 kHz.

Distortion:
- Total Harmonic Distortion (THD)
at rated output power -20 dB at 1 kHz : <1%

Loudspeaker Outputs: *(not applicable to LBB 1230/00)*

Output Voltage	**LBB 1231**	**LBB 1232**	**LBB 1233**
100 V	100 V	100 V	100 V
70 V	70 V	70 V	70 V
50 V	50 V	50 V	50 V
8 Ohm output	15.5 V	22 V	31 V

Minimum Load	**LBB 1231**	**LBB 1232**	**LBB 1233**
100 V	333 Ohms	167 Ohms	83 Ohms
70 V	163 Ohms	82 Ohms	41 Ohms
50 V	83 Ohms	42 Ohms	22 Ohms
8 Ohm output	8 Ohms	8 Ohms	8 Ohms

Signal-to-Noise Ratio :
- input connected with 2 kOhm: S/N > 80 dB between 20 Hz and 20 kHz flat.

LED VU.
- LED VU On:
- 20 dB +/- 6 dB green (w.r.t. rated output voltage)
- 6 dB +/- 3 dB green (" " " ")
- 0 dB +/- 2 dB red (" " " ")

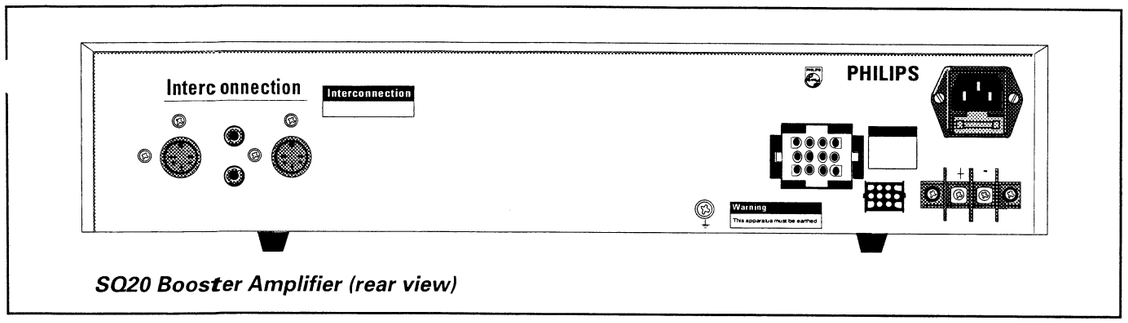
Safety : : According to IEC 65 and BS 415

Environmental conditions:
- Operation temperature : - 10 to + 45°C
- Storage temperature : - 40 to + 70°C
- Relative humidity : 15 to 90%

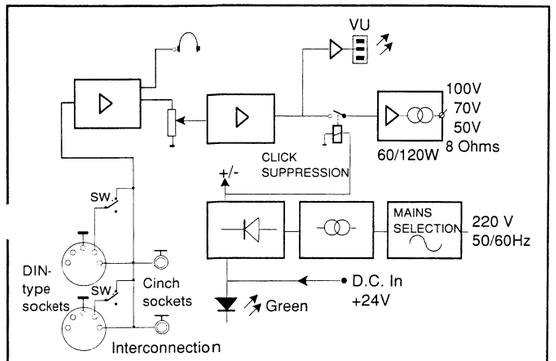
Dimensions: heigth: 100 mm
width: 440 mm. Including 19" brackets : 483 mm
depth: 308 mm. Including handles : 348 mm

Weight :	**LBB 1230/00**	**LBB 1231/00**	**LBB 1232/00**	**LBB 1233/00**
	5.5 kg	8.1 kg	9.1 kg	11.2 kg

This product is manufactured to comply with the radio interference requirements of the Council Directive of 87/308/EEC.



SQ20 Booster Amplifier (rear view)



Circuit diagram

TECHNICAL DATA

Mains supply: 110, 127, 220 V +/- 10%,
230 V & 240 V +6/-10% 50/60 Hz
The amplifier is delivered connected for 220 - 230 Volts A.C.

Battery supply: + 24 V, (0 V grounded)
deviation -10 to +20%

Power Consumption: **LBB1234/00:** 176 VA
LBB1235/00: 352 VA

'outs
.terconnection
- input sensitivity : 1 V
- input impedance : 20 kOhm

Outputs

	LBB 1234/00	LBB 1235/00
- Rated Output Power		
(mains)*	60 watt	120 watt
(battery)*	30 watt	60 watt

* acc. IEC 268

Frequency Response
- Measured at 10 dB below rated output power: within +1 to -3 dB between 60 Hz and 18 kHz

Distortion
- Total Harmonic Distortion (THD) at rated output power -20 dB at 1 kHz : <1%

Loudspeaker Outputs

Output Voltages	LBB 1234/00	LBB 1235/00
100 V	100 V	100 V
70 V	70 V	70 V
50 V	50 V	50 V
8 Ohm Output	22 V	31 V

Minimum Load	LBB 1234/00	LBB 1235/00
100 V	167 Ohms	83 Ohms
70 V	82 Ohms	41 Ohms
50 V	42 Ohms	22 Ohms
8 Ohm Output	8 Ohms	8 Ohms

Signal-to-Noise Ratio
- Input connected with 2 kOhm : S/N >80 dB between 20 Hz and 20 kHz flat.

LED VU :
LED VU On : - 20 dB +/- 6 dB green (w.r.t rated output voltage)
- 6 dB +/- 3 dB green (w.r.t rated output voltage)
- 0 dB +/- 2 dB red (w.r.t rated output voltage)

Safety : According to IEC 65 and BS415

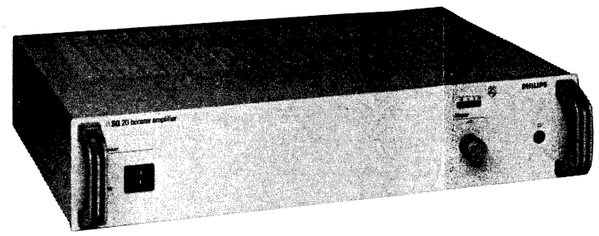
Environmental conditions
- Operation temperature : -10 to +45°C
- Storage temperature : -40 to +70°C
- Relative humidity : 15 to 90 %

Dimensions : height : 100 mm
width : 440 mm. Including brackets : 483 mm
depth : 308 mm. Including brackets : 348 mm

Weight : **LBB 1234/00** 8.9 kg **LBB 1235/00** 11 kg

This product is manufactured to comply with the radio interference requirements of the council Directive of 87/308/EEC.

SQ20
Booster Amplifiers



- **P.A. power amplifiers for table-top and 19" rack mounting.**
- **Matching transformer for loudspeakers with 100 V , 70 V , 50 V and 8 Ohm low ohmic tappings.**
- **Emergency external battery supply.**
- **Monitoring facility with VU meter and headphone.**
- **Interconnection facility.**

The ***SQ20*** range of stand-alone public address ***'high performance booster amplifiers'*** has been designed to fulfil most professional public address requirements.

Ease of installation, together with excellent ***'reliability'*** and service 'accessibility', have been optimized in their design.

The **SQ20** range of booster amplifiers is available in a 60 watt, and a 120 watt version, each offering its own advantage in fulfilling a variety of application needs.
Two ***'interconnection'*** sockets allow other amplifiers in the SQ20 range to be connected. Such amplifiers include the range of high performance mixing and premixing amplifiers or should requirements change and the system needs expanding then additional booster amplifiers could be connected.

The outputs of the amplifiers, feeding their respective loudspeakers or groups of loudspeakers are provided via an in-built loudspeaker matching transformer.

The transformer provides a choice of three line level output voltages, 50 V, 70 V and 100 V, plus an 8 Ohm low ohmic output, this means that a large choice of loudspeakers, may be connected. An advantage of such an in-built facility is that the volume level of each loudspeaker, or group of loudspeakers may be set accordingly.

The loudspeaker matching transformer's outputs are fed to their respective loudspeakers via a 'Mate-N-Lok' connector positioned at the rear of the amplifier, thus providing simplicity in connecting loudspeakers.

A master volume control, controls the overall gain level of the amplifier.
A front panel LED, located in close proximity to the mains switch, illuminates when the amplifier is powered up.

Indications for monitoring the amplifiers output power are provided by front panel mounted LED's.

The mains transformer may be tapped for different ac mains voltages of 110 V, 127 V, 220-230 V and 240 V.
On delivery all amplifiers are supplied with a 2 m long mains lead terminated at one end with a 2-pole mains plug with earth contacts, and at the other end with a C.E.E mains connector.

Two mounting brackets (LBB 1239/00) and their associated screws may be supplied for 19" rack mounting purposes.

FIGURE 2.3
LBB 1234 - LBB 1235

Speech filters
An "in-built" speech filter, available on all microphone channels reduces the bass content of the signal, allowing announcements and messages to be amplified with greater clarity.

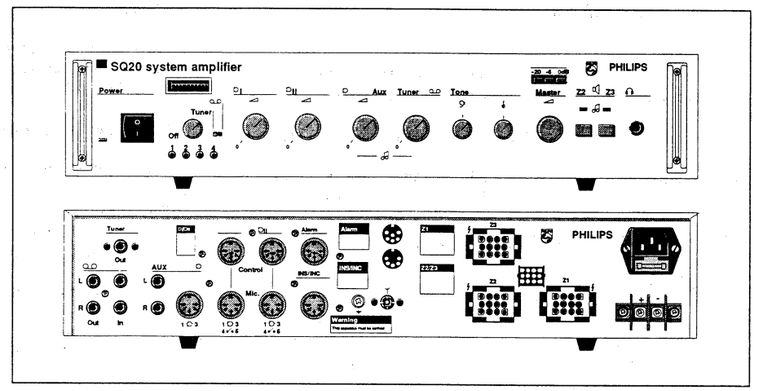
Tape/cassette recorder connection
Facilities at the rear of the amplifier are provided for connecting a tape/cassette recorder" for playback and recording purposes. This feature provides a method of distributing the music of your choice, or to broadcast pre-recorded messages such as sale announcements for example.

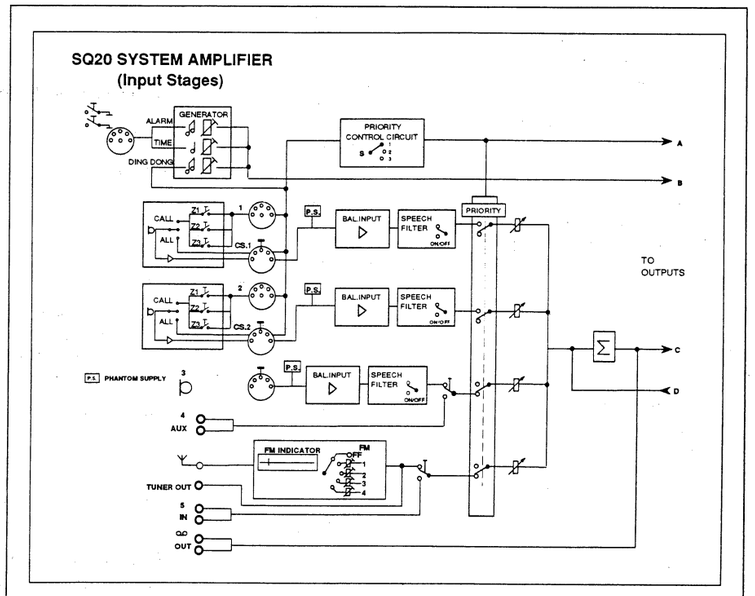
In-built FM tuner
An important feature of the system amplifier is its in-built high quality FM tuner, providing a choice of four pre-set channels, each channel being tuned and pre-set by means of miniature tuning controls located at the front of the amplifier.
A standard aerial socket is provided at the rear of the amplifier for connection to the FM tuner. A single cinch type socket provides an output connection from the FM tuner.

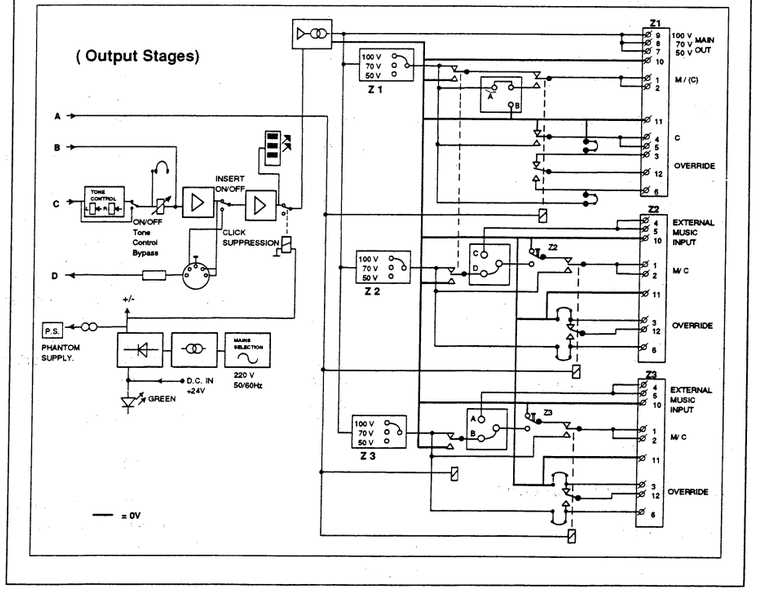
External Music Input
If required an external music source can be connected via the 100 V input of the MATE-N-LOK output connector. This facility is only available on loudspeaker zones 2 and 3.
The versatility of the system amplifier is such that if a call is active in one particular zone, the remaining loudspeaker zones to which the external music source is routed (applicable to zones Z2 and Z3 only) will not be muted in the event of a call.

Interconnection/Insertion
A "interconnection/insertion"(INS/INC) socket allows other amplifiers in the SQ20 range to be connected should requirements change and the system needs to be expanded.
This socket is also available for connecting other additional auxilliary equipment, such as a graphic equaliser...for example.

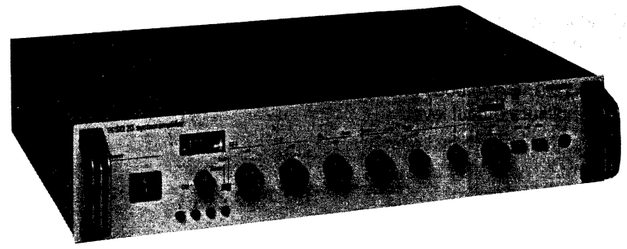
Alarm/Time
An in-built alarm/time circuit allows for the connection of an external alarm/clock push-button device connected via a 6-pole 240° DIN-type socket.
This feature is particulary useful whenever it is necessary to attract immediate attention, in an emergency for example. Pressing an alarm button will ensure that an alarm tone (twin-tone) notifies the listening public of the situation. Such a service will always take top priority.
A 1-tone time signal (4-seconds), mixed with all other inputs can also be sounded giving warning to the listening public, giving warning when a workshop is about to close for example.







SQ20 System Amplifiers
LBB 1237/00, LBB 1238/00



- **High performance, integrated stand-alone public address system.**
- **Loudspeaker zone routing facilities to three loudspeaker zones, independently, or collectively**
- **Microphone priority facility providing one of three system operational modes.**
- **Audible in-built attention tone preceding a Call, plus alarm and time signal tones.**
- **Loudspeaker override facility for 3 and 4 wire systems.**

The SQ20 range of 'high performance system amplifiers" has been designed to provide the user with a versatile, integrated stand-alone public address system. The amplifier includes 'loudspeaker zone routing facilities', and other vital system features each capable of fulfilling the wide variety of public address requirements.

They would typically be used in medium sized factories, garages, offices, supermarkets, shopping areas, schools and sport complexes etc..

Ease of operation combined with good service accessibility and reliability have been optimised in their design.

Due to their architectural design and high degree of versatility, they are ideal for use in multi-zone projects requiring amplification for a variety of audio signals, simultaneously.

The **SQ20** range of system amplifiers is available in a 60 watt, and a 120 watt version, each version providing the power handling capacity to meet virtually any system requirement.

The range of SQ20 system amplifiers is available with the following type numbers:

- **LBB 1237/00** (60 Watt)
- **LBB 1238/00** (120 Watt)

Each amplifier includes 'three microphone input channels' , each supplied with phantom power. Two channels are for use with the Philips stand-alone "Call station" microphone, type number LBB 9427/10.
The third microphone input, switchable, is for use with either the wide range of Philips Dynamic or BPE microphones, or be used as an auxilliary line level input for connection to different sound sources, such as a tape/cassette recorder or similar background music source.

The user-friendly "Call station" microphone, LBB 9427/10 provides push-button facilities for 'routing announcements and messages' to selected loudspeaker zones, either individually or to all three loudspeaker zones collectively.

This feature is particularly useful where a message must reach the staff only, and not the general public, as in a supermarket.. for example

Attention Tone
Preceding any call or announcement an audible attention tone will alert the listening public.

Microphone Priority
An in-built "microphone priority" facility provides the user with the option of assigning one of three system operational modes.
1. *First -In First -Served.*
The first call station user gains access to the system.
2. *Serial Priority.*
Call station microphone No.1 is given priority over call station microphone No.2.
3. *Single Call Station*
Call station No.1 has priority over all other connected inputs, while call station No.2 is mixed with other connected inputs. Call station No.2 can be replaced with a normal BPE or Dynamic microphone.

FIGURE 2.4
LBB 1237 - LBB 1238

Loudspeaker Outputs

The loudspeaker outputs of the amplifier are provided via an output transformer, allowing connection to a wide range of loudspeakers.The outputs are connected via three Mate-N-Lok connectors, one per loudspeaker zone, each mounted on the amplifiers rear panel.
The outputs can be tapped per zone independently, at three different voltages, namely 50V, 70V and 100V, meaning that large groups of loudspeakers covering long distances can be connected.

Override Facility

An in-built override relay can be used to provide loudspeaker override facilties, using 3 and 4 wire systems. This means that all loudspeakers in the system, which include a volume control, can be activated (even if they are not turned on) so that emergency messages or announcements are broadcast at full power.
An additional feature of the override relay, is to trigger external functions, (...by Call signals to illuminate warning lamps in designated areas for example).

System Amplifier Controls

The front panel contains rotary controls for the input sensitivity of both call station input channels, the auxilliary/microphone channel, and the tuner/tape recorder channel. Similar controls adjust the bass and treble tone adjustment of the overall amplified signal.

A master volume control, controls the overall gain level of the amplifier.
A front panel LED, located in close proximity to the mains switch, illuminates when the amplifier is powered up.

Two manual front panel zone selection buttons which if pressed directly route the chosen music source, to the selected loudspeaker zone. Indicators, indicate the chosen zone or zones selected.

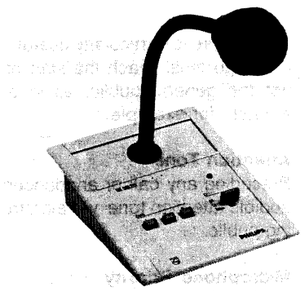
Headphones can be connected via a 6.3mm headphone socket for easy system monitoring, while three front panel LED's (-20,-6 and 0dB) give at a glance the amplifiers output level.

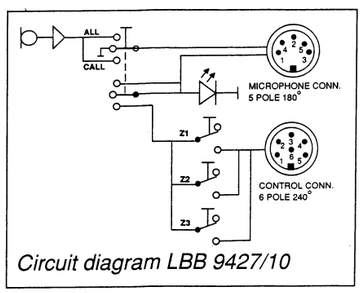
Power supply

The SQ20 system amplifier, as well as being powered from the a.c mains can also be powered from an emergency battery supply of 24 volts d.c. The mains transformer can be tapped for different a.c mains voltages of 110V, 127V 220-230V and 240V.

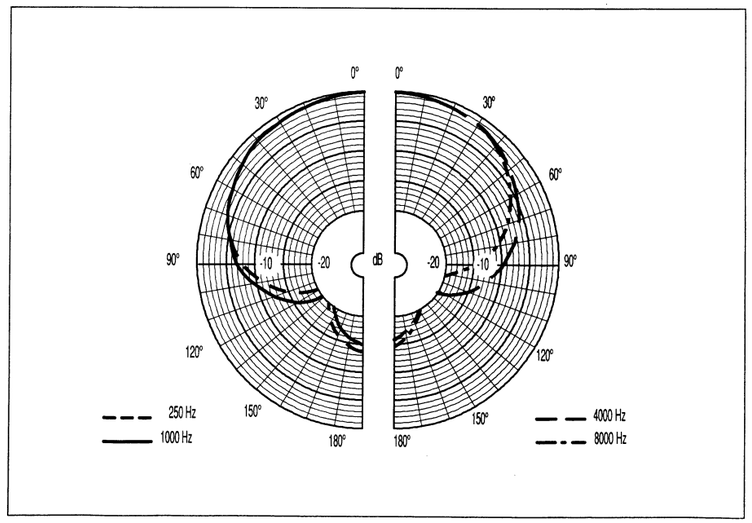
On delivery, all amplifiers are supplied with a 2m long mains lead terminated at one end with a 2-pole mains plug with earth contacts, and at the other end with a C.E.E. mains connector.

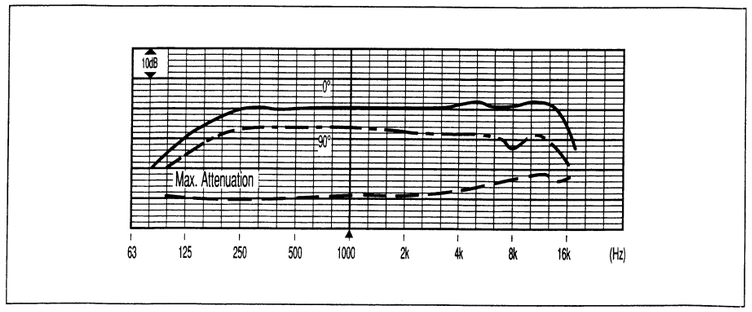
Call Station Microphone LBB 9427/10





Circuit diagram LBB 9427/10





TECHNICAL DATA

Mains supply : 110, 127, 220V +/- 10%,
230V & 240V +6/-10% 50/60 Hz
The amplifier is delivered connected for 220 - 230 Volts A.C.

Battery supply : + 24 V, (0 V grounded) deviation -10 to +20%

Power consumption : **LBB 1237/00** 187 VA **LBB 1238/00** 374 VA

Mixer Amplifier (Pre -amp. section)

Inputs

Microphone *(Channel 1 -2 - 3) :*
- balanced input with phantom supply : 12V
- input sensitivity : 1.5mV
- input impedance : 1360 Ohm
- max.overload with 2% distortion : : 25 dB
Priority channel 1&2 over channels 3 & 4.

AUX. *(Channel 3)*
- input sensitivity : 120 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 20 dB

Tape In. *(Channel 4)*
- input sensitivity : 120 mV
- input impedance : 47 kOhm
- max. overload within 2% distortion : 20 dB

FM Tuner : In-built FM tuner

Insertion
- input sensitivity : 1V
- input impedance : >20 kOhm

Chime,Alarm and Tone signals
- Chime (2-tone) via Call station : (1) 440 Hz (1 sec.)
(2) 555 Hz (0.5 sec.)
- time signal : 555 Hz (4 sec. const.)
- alarm signal : 440 Hz & 555 Hz
(0.25 sec. constant)

Outputs

Headphone
- output signal : 3V
- output impedance : 68 Ohm

Interconnection/Insert
- output signal : 1V
- output impedance : <200 Ohm
- output short circuit protected

Tape Out
- output signal : 500 mV
- output impedance : 3.3 kOhms

Tuner Out
- output impedance : <200 Ohms

In-built FM Tuner
- frequency range : 87.5 - 108 MHz
- aerial impedance : 75 Ohm
- sensitivity at 26 dB S/N at 75 kHz dev. : 1 uV
- signal - to - noise at 40kHz dev. : 55 dB

Frequency Response
- at rated output power : 60 Hz to 18 kHz (+1 to -3dB)
- speech filter response : -3dB at 315Hz (slope 6dB/octave)

Distortion
- total harmonic distortion at rated output voltage : < 0.5% (1kHz)

Tone Controls
- bass control : +/- 10dB at 100Hz
- treble control : +/- 10 dB at 10kHz

Signal/noise ratio :
measured with microphone input terminated with 200 Ohm resistor, phono input with 2 k Ohm, AUX, tape and CD input with 2 k Ohm:
- master volume control max. and all volume control min. : 70 dB
- 1 microphone control max. : 60 dB
- AUX : 60 dB
- tape : 60 dB

(measured between 20Hz and 20 kHz flat)

Booster Amplifier Section

Inputs

Interconnection/Insert
- input sensitivity: : 1V
- input impedance : 20 kOhm

Outputs

	LBB1237	LBB 1238
- rated output power (mains) * :	60 Watt	120 Watt
- rated output power (battery)* :	30 Watt	60 Watt

* acc. IEC 268

Frequency Response:
- measured at 10 dB below rated output power : within +1 to -3dB between 60 Hz and 18 kHz.

Distortion:
- total harmonic distortion at rated output voltage : < 1%(1kHz)

Loudspeaker Outputs:

Output Voltage 100, 70V, 50V	LBB 1237	LBB 1238
Minimum Load		
100 V	167 Ohms	83 Ohms
70 V	82 Ohms	41 Ohms
50 V	42 Ohms	22 Ohms

Signal-to-Noise Ratio
- input connected with 2 kOhm: S/N >80 dB between 20 Hz and 20 kHz flat.

LED VU. LED VU On: - 20 dB +/- 6 dB green
- 6 dB +/- 3 dB green
0 dB +/- 2 dB red
The above are w.r.t. rated output voltage.

Safety : According to IEC 65 and BS 415

Environmental Conditions:
- Operation temperature : - 10 to + 45° C
- Storage temperature : - 40 to + 70°C
- Relative humidity : 15 to 90%

Dimensions: : H x W x D: 100 x 440 x 308
width including 19" brackets: 483 mm
depth including handles 348 mm

Weight : **LBB 1237/00** 9.8 kg **LBB 1238/00** 11.9 kg

Call Station Microphone LBB 9427/10

Description : table-stand microphone with 3-position switch Off, "ALL Call" and "Call", plus LED indication On and busy. Three push-buttons for selection of 3 loudspeaker zones, individually or collectively.

- transducer : BPE condenser
- polar pattern : Hypercardioid
- freq.range (acc. to IEC 268-4) : 180 - 12,800 Hz at -3dB
145 - 13,800 Hz at -6dB
- sensitivity (acc. to IEC 268-4) : 2.8 mV/Pa +/- 3 dB
(-51 dB re. to 1 V/Pa)
Max. SPL for THD <3% : 134 dB
Rated output impedance : <200 Ohm
- Load impedance : > 600 Ohm
- Equivalent input noise level : 19 dB(A)
- Phantom power supply : 11 - 52 V
(acc. to DIN 45596 and IEC 268 - 15A)
- Current consumption : < 5 mA
- Ambient temperature range : -10°C to +55°C
- Ambient rel. humidity : 80% max. at 20°C
- Cable : 2-core + 2 core screened, 3m & 5 core, 3m
- Connector : 5-pole 180° DIN-plug
6-pole 240° DIN-plug
- weight : 0.87 kg (incl. cable)

These product are manufactured to comply with the radio interference requirements of the Council Directive of 87/308/EEC.

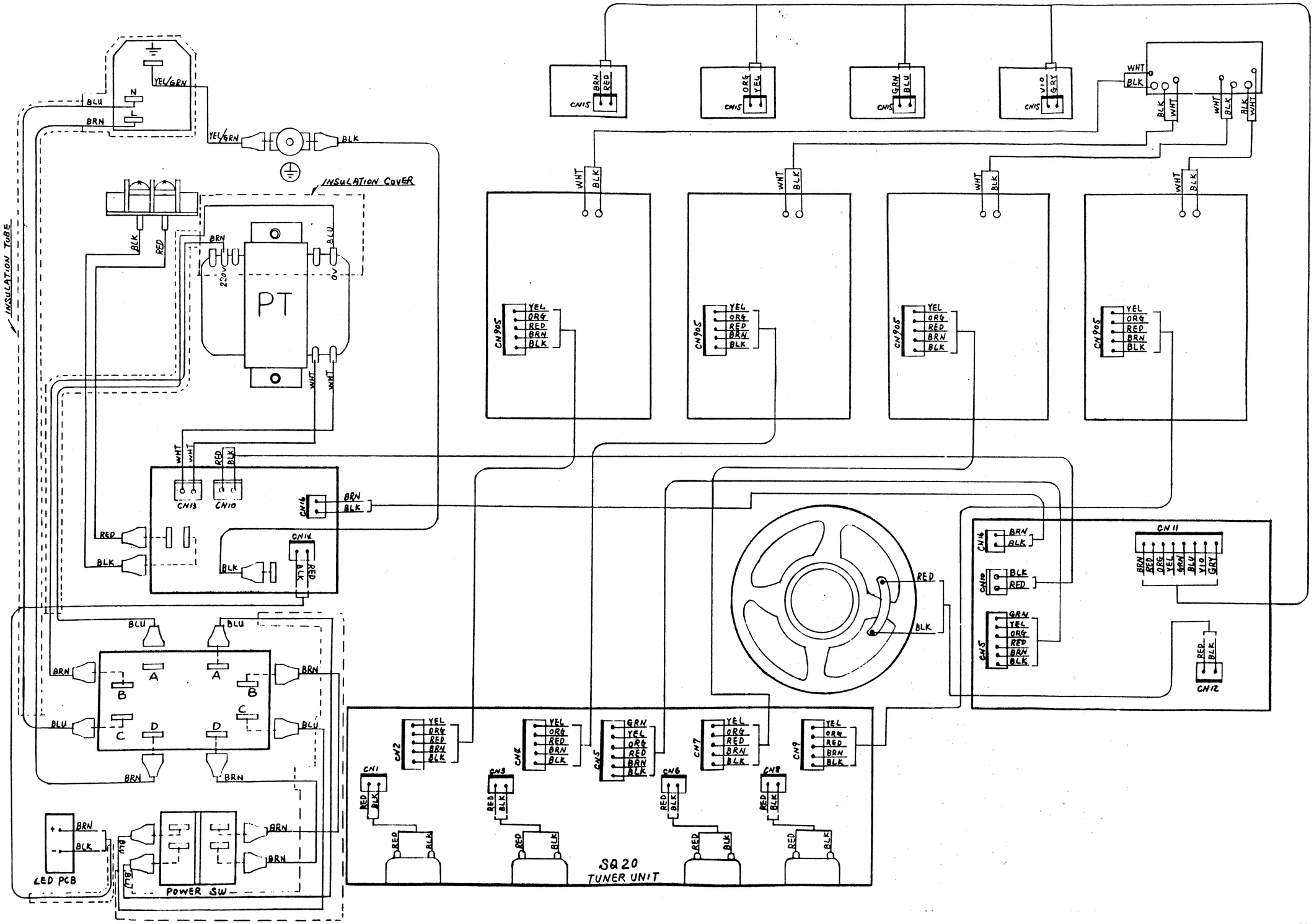


FIGURE 7.1
LBB 1229
WIRING DIAGRAM

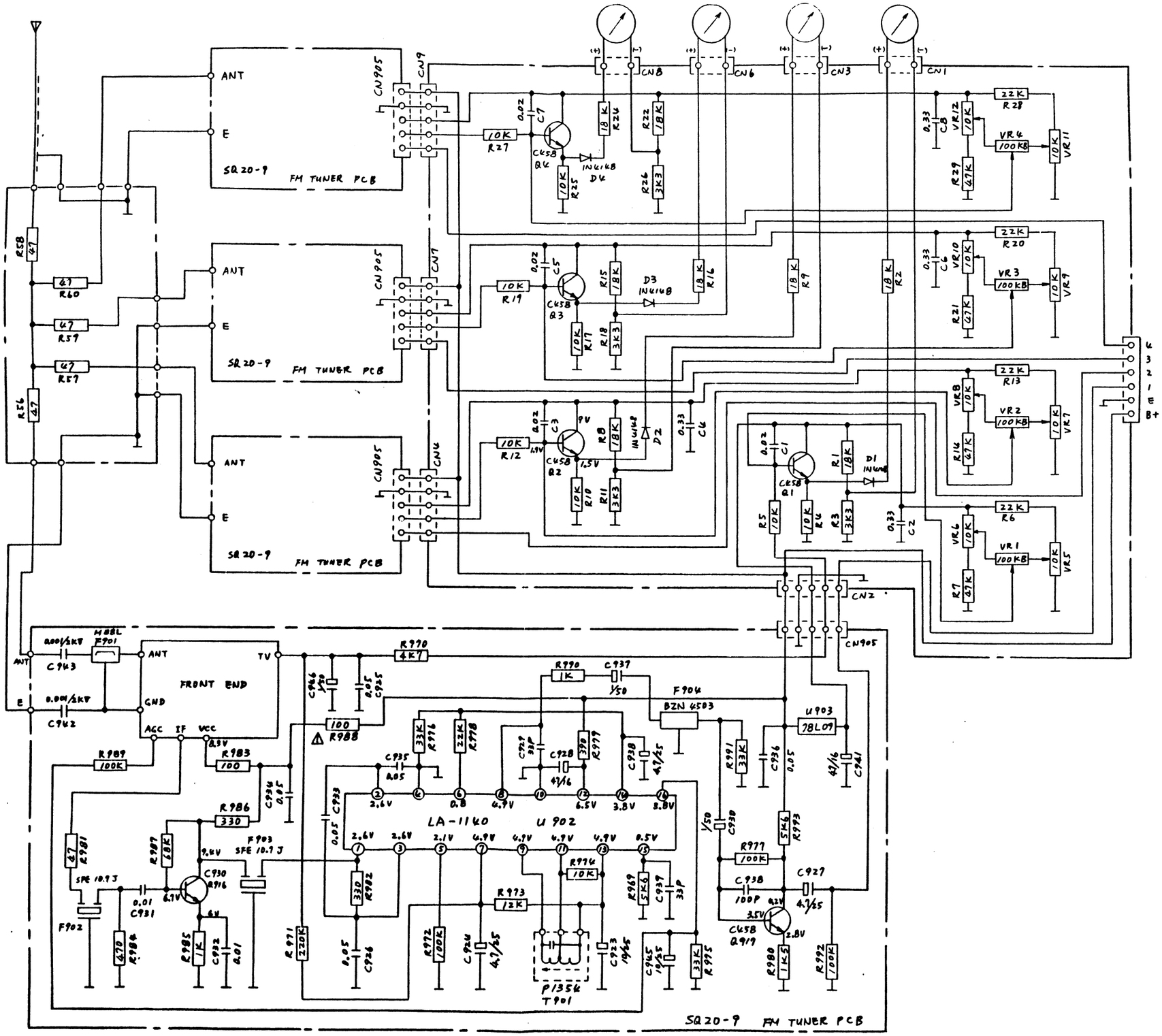


FIGURE 7.2
LBB 1229
CIRCUIT DIAGRAM PART 1

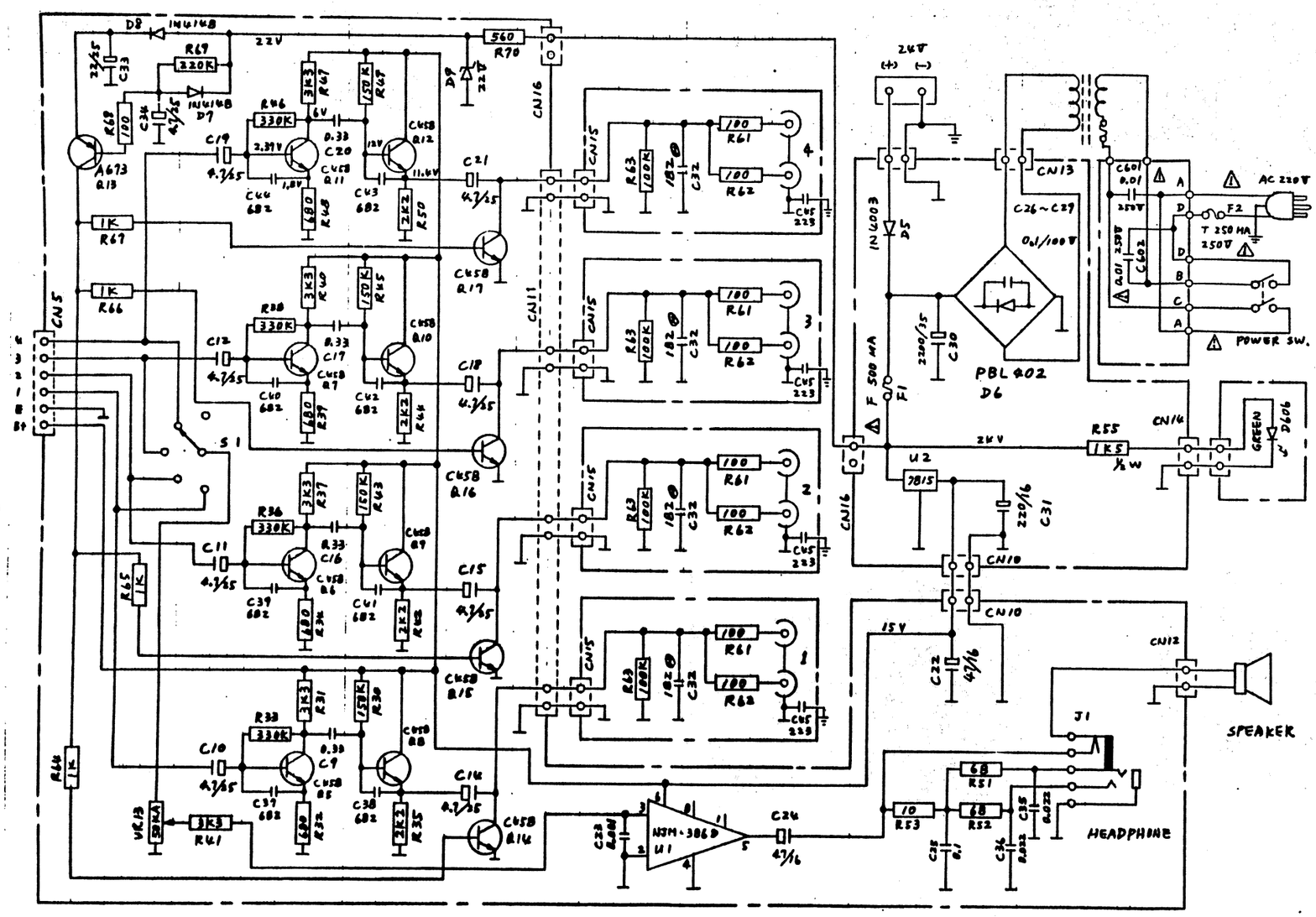
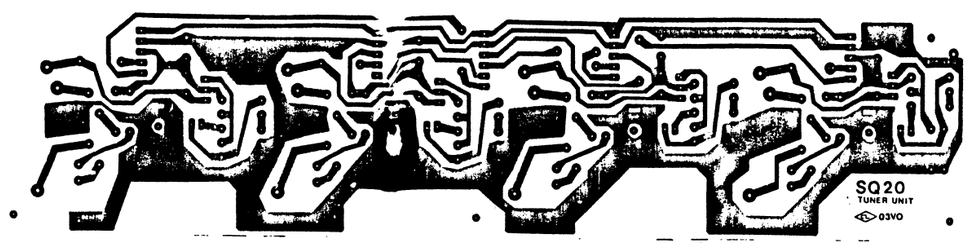
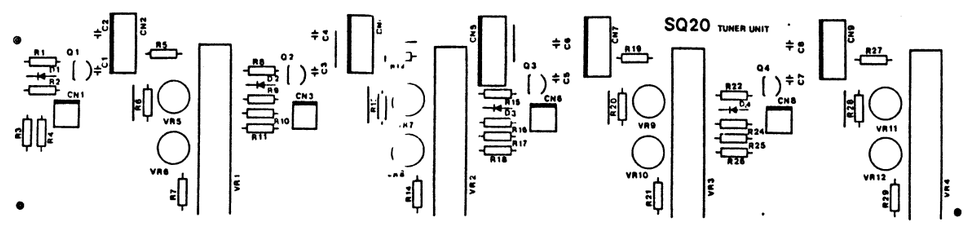
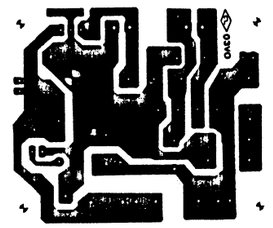
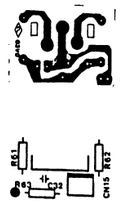


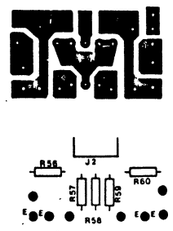
FIGURE 7.3
LBB 1229
CIRCUIT DIAGRAM PART 2

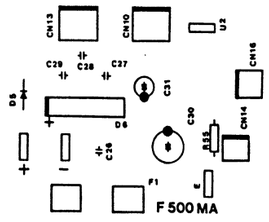


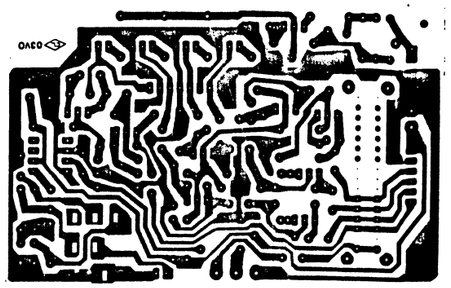


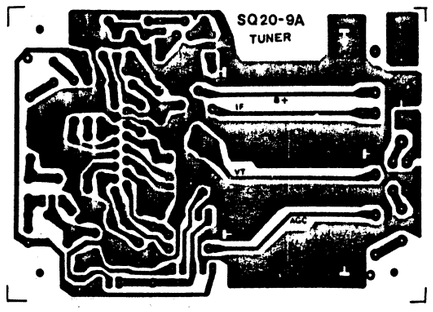


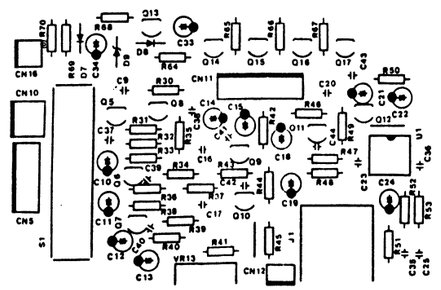












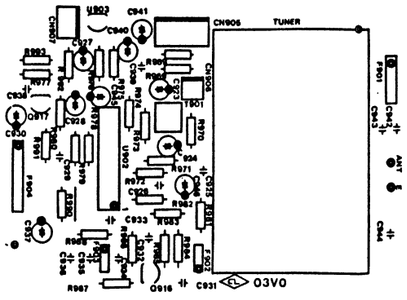
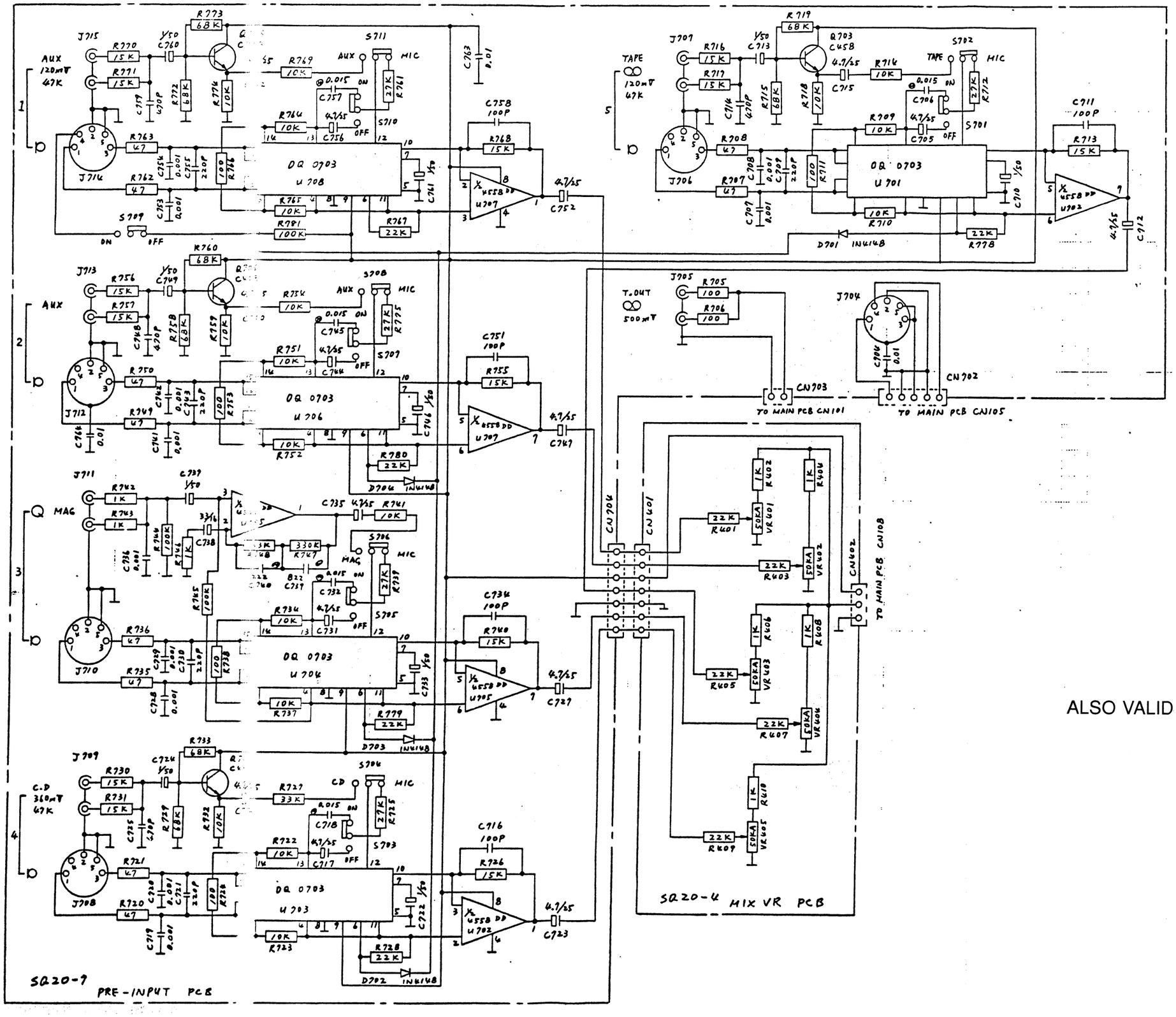


FIGURE 7.4
LBB 1229
PCB LAY-OUT



ALSO VALID FOR: LBB 1 231
LBB 1 232
LBB 1 233

FIGURE 7.5
LBB 1230
CIRCUIT DIAGRAM

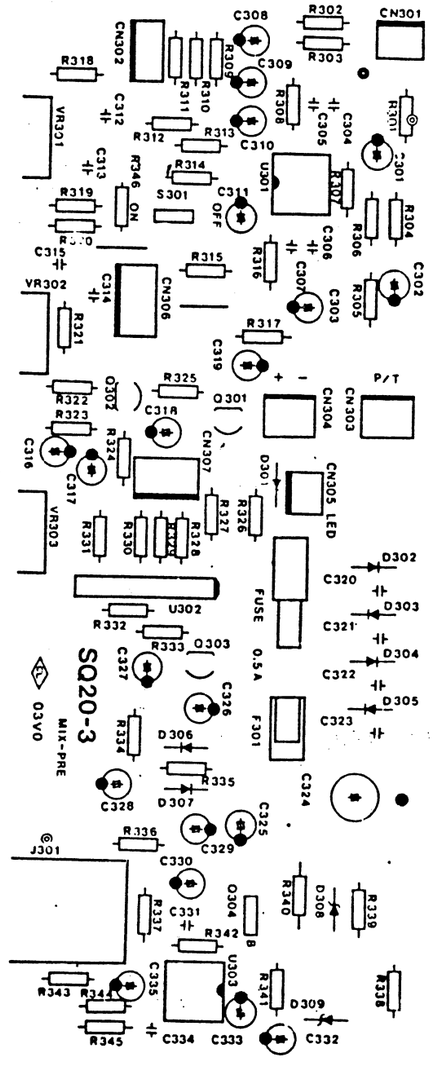
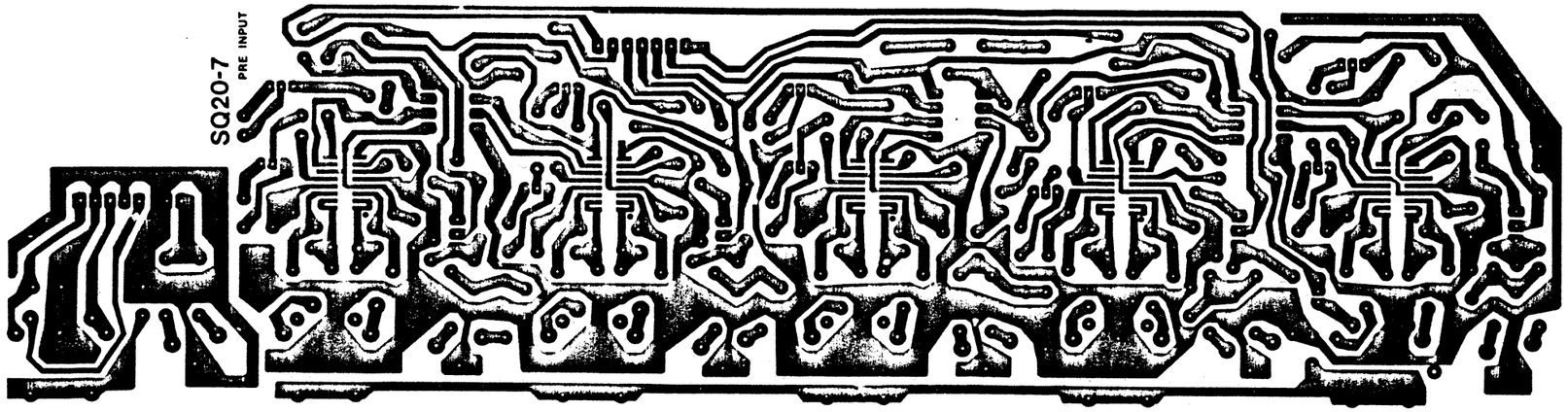
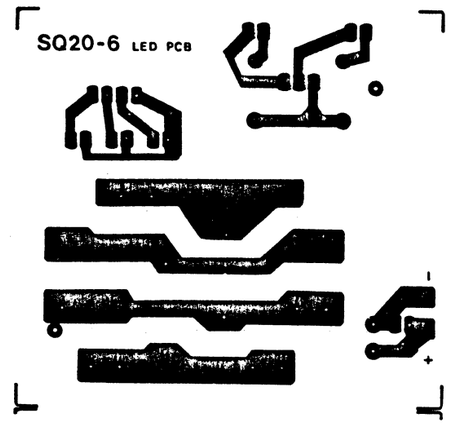
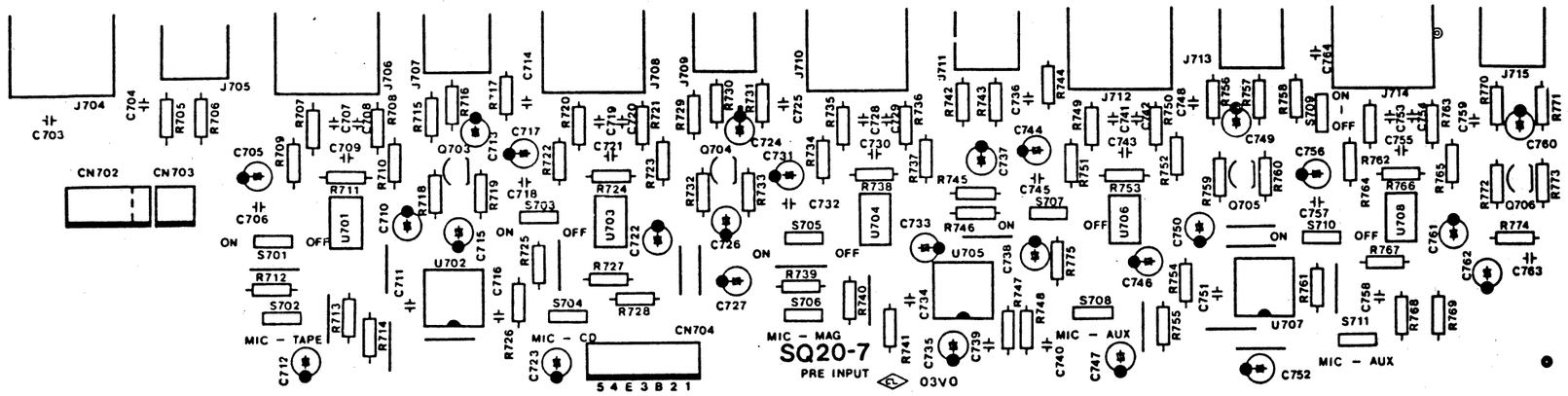
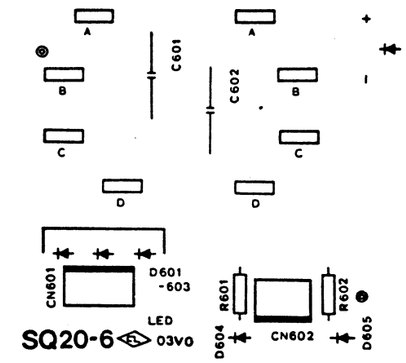


FIGURE 7.6
LBB 1230
PCB LAY-OUT









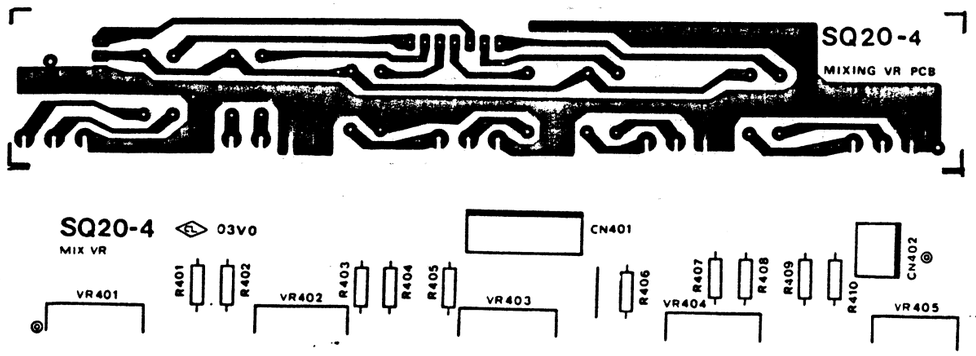


FIGURE 7.7
LBB 1230
PCB LAY-OUT

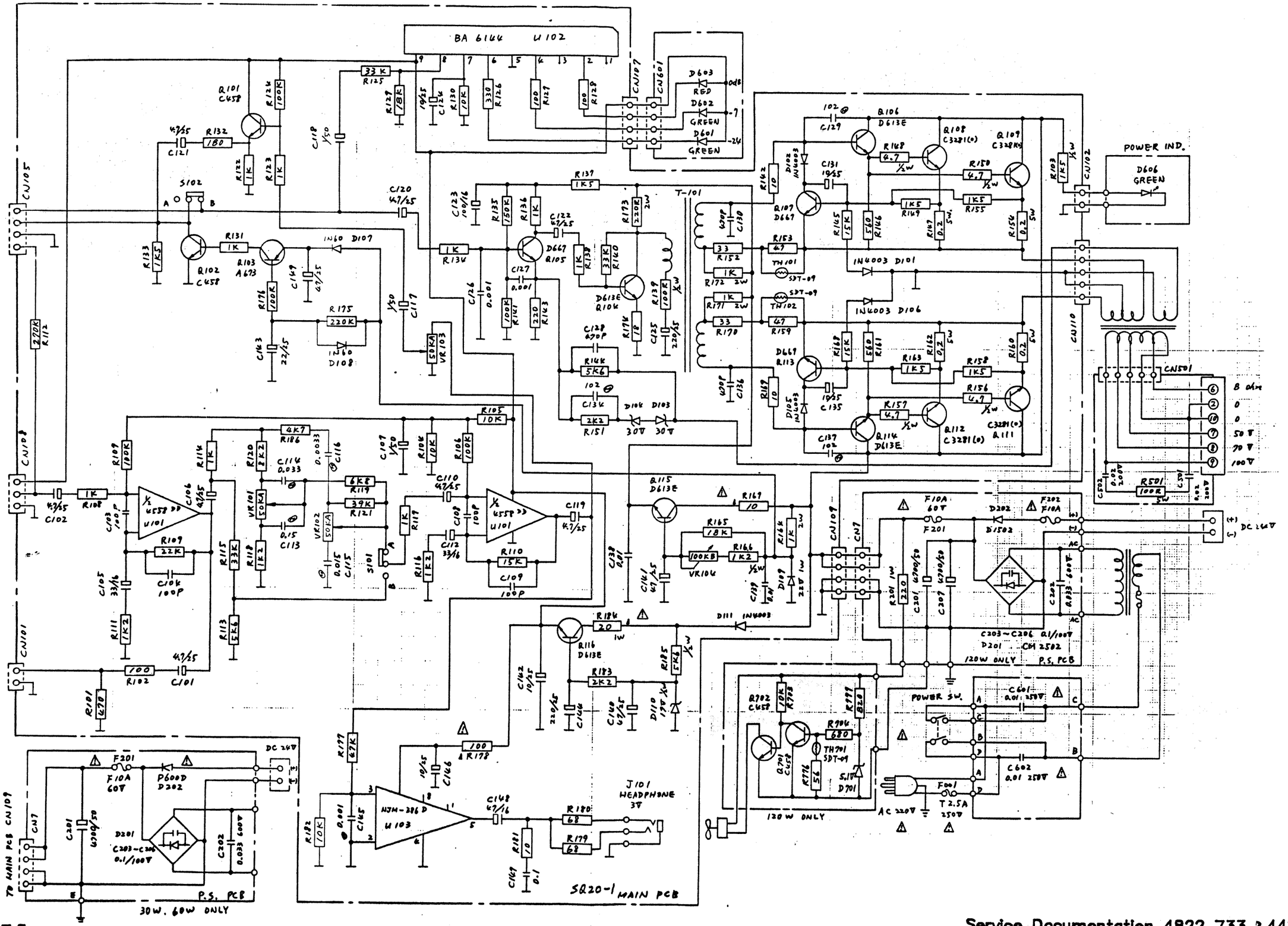


FIGURE 7.8
LBB 1231/1232/1233
CIRCUIT DIAGRAM PART 1

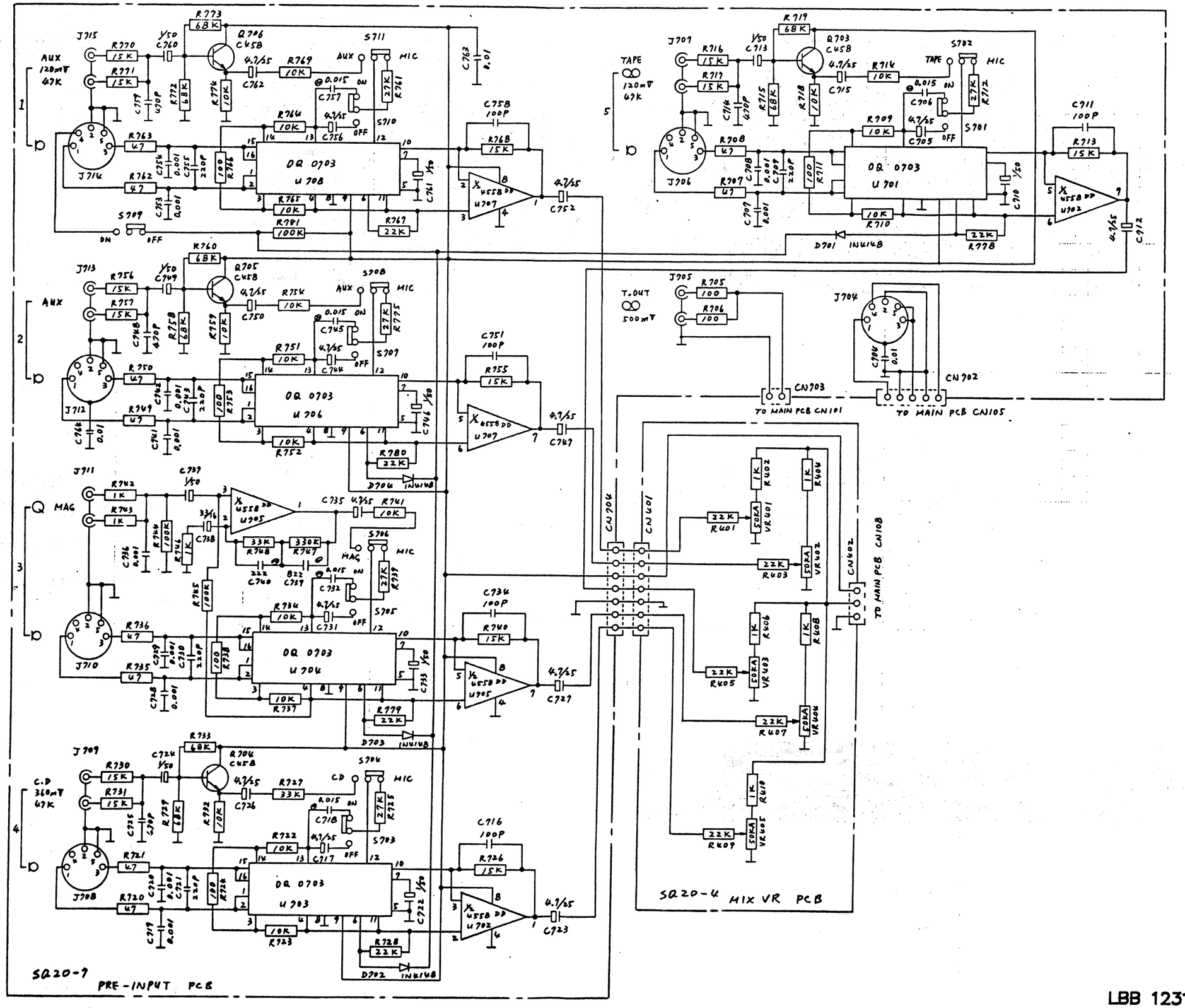
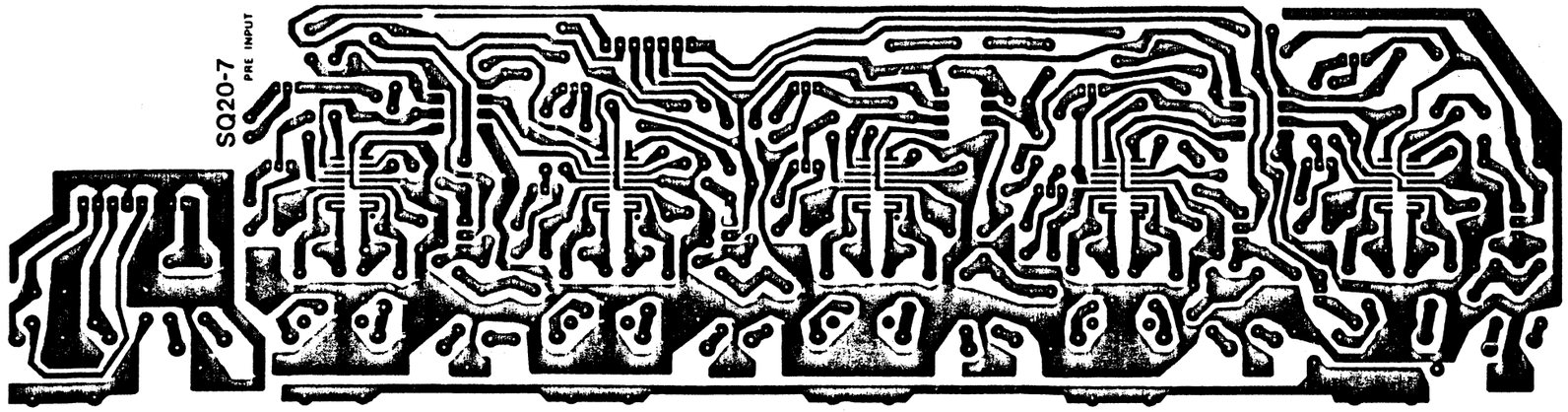
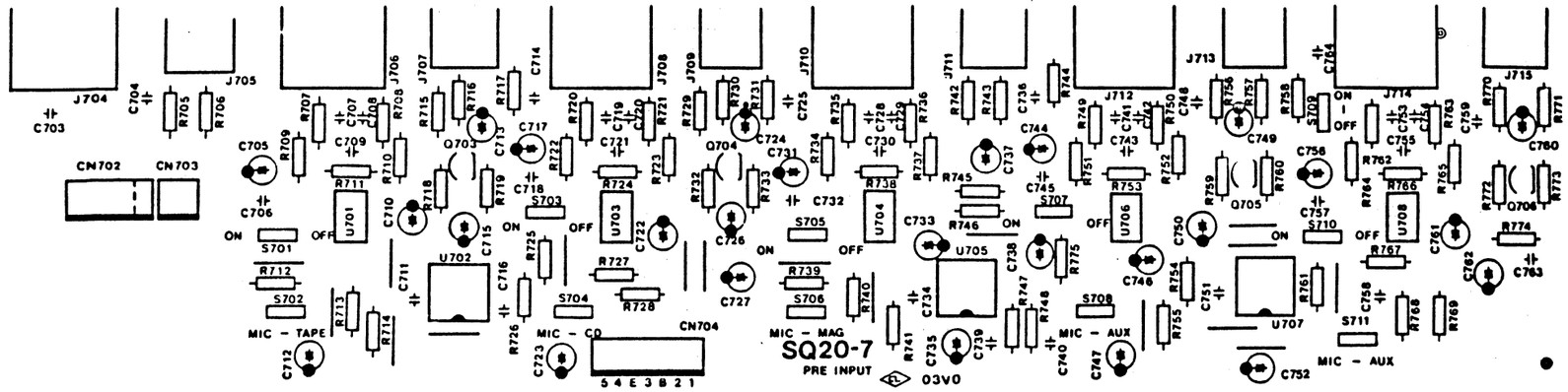
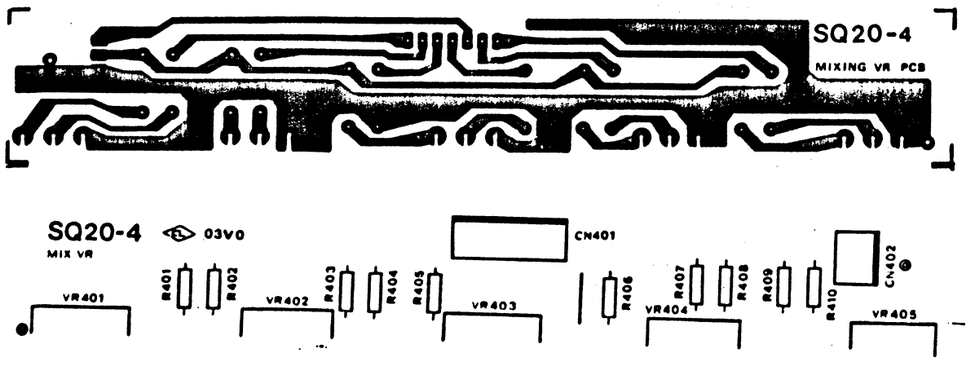
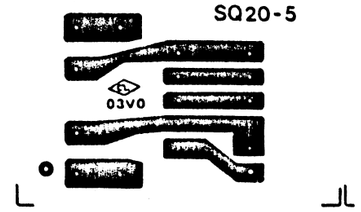


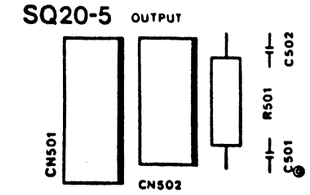
FIGURE 7.9
LBB 1231/1232/1233
CIRCUIT DIAGRAM PART 2











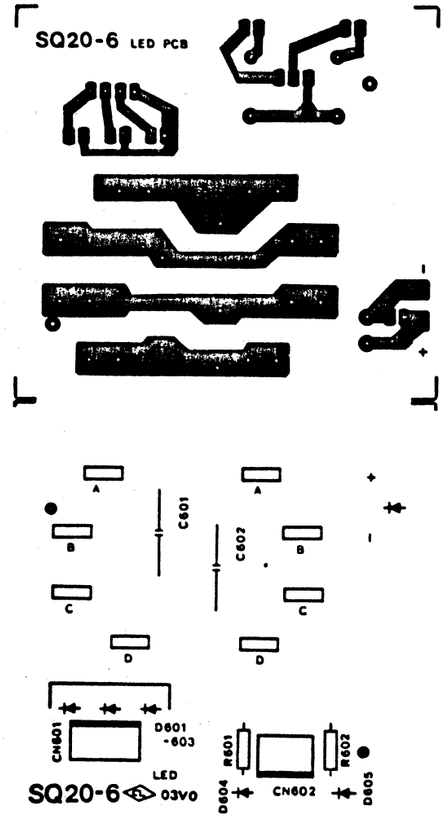
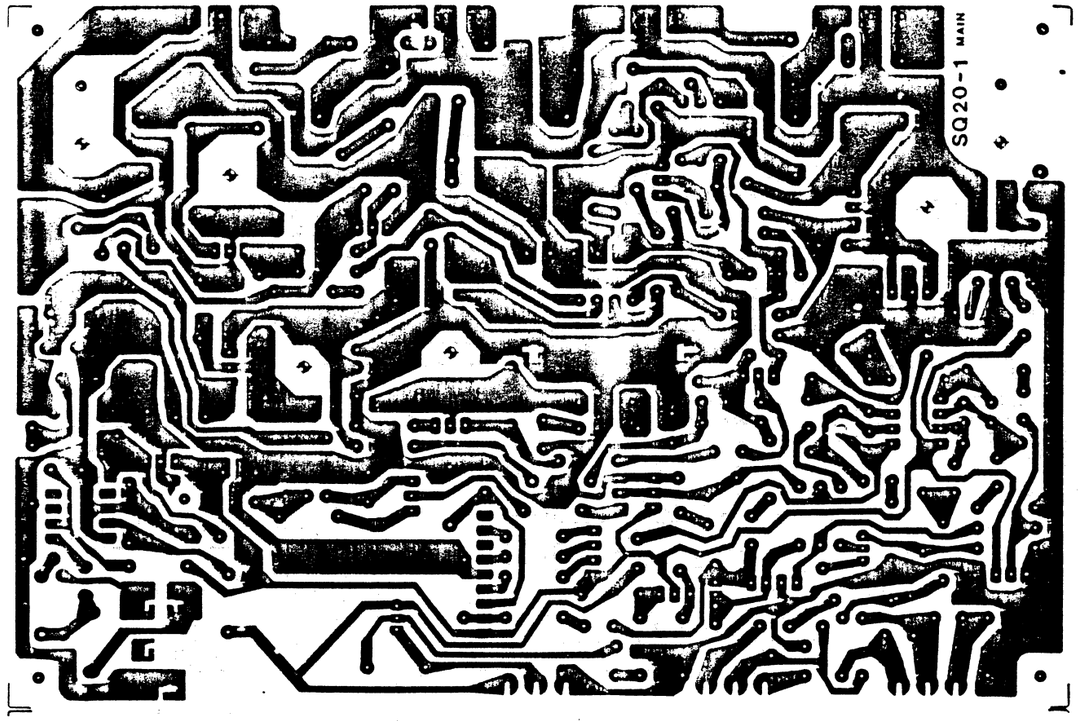
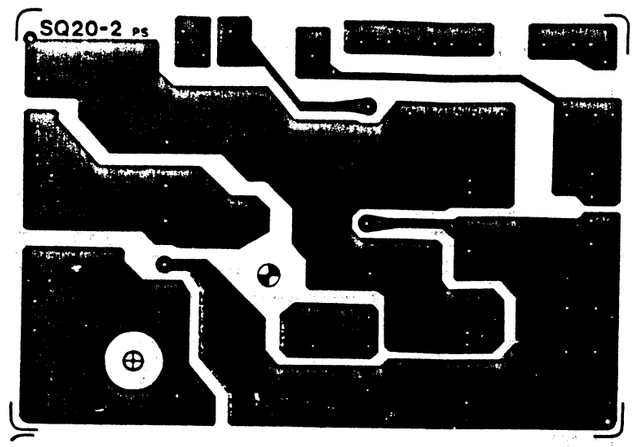
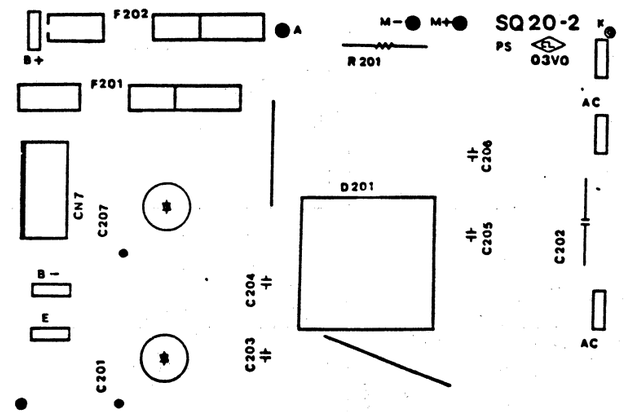


FIGURE 7.10
LBB 1231/1232/1233
PCB LAY-OUT PART 1







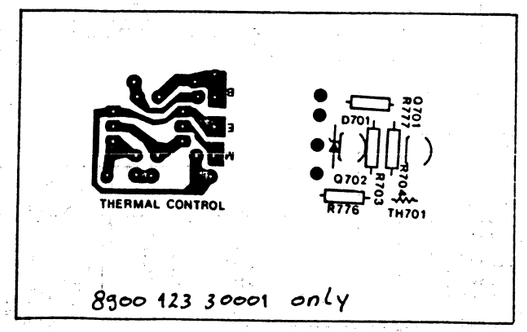
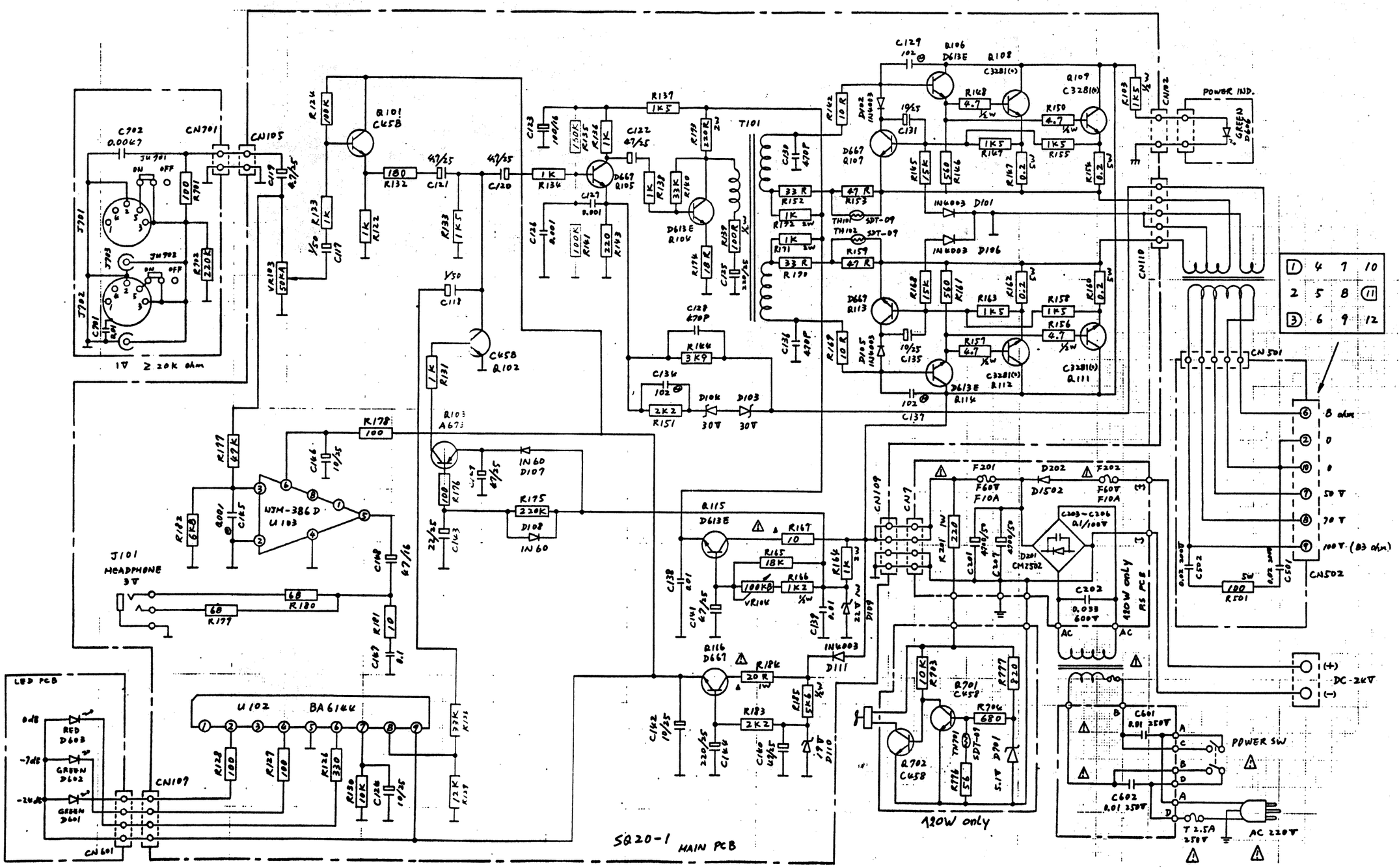


FIGURE 7.11
LBB 1231/1232/1233
PCB LAY-OUT PART 2


SQ20-1 MAIN PCB
LBB PCB
CN101
CN601
CN701
CN105
CN109
CN110
CN502
CN501
J701
J702
J703
J101
HEADPHONE
3V
JW701
JW702
VR103
50KA
U101
NJM-386 D
U102
BA 6144
U103
A673
T101
D669
D613E
C458
IN4003
IN60
SDT-09
CM2502
F201
F60V
F10A
F202
D202
D1502
D201
POWER IND.
GREEN
RED
POWER SW
AC 220V
T 2.5A
250V
DC-24V
(+)
(-)
8 ohm
0
4
5V
70 V
100V (83 ohm)
120W only
AS PCB
AC
C202
0.033
600V
C601
0.01 250V
C602
0.01 250V
C203-C206
0.1/100V
R701
R702
R703
R704
R777
D701
D702
D110
D111
D107
D108
D109
D104
D105
D106
TH101
TH102
VR104
R501
C501
C502
C503
C504
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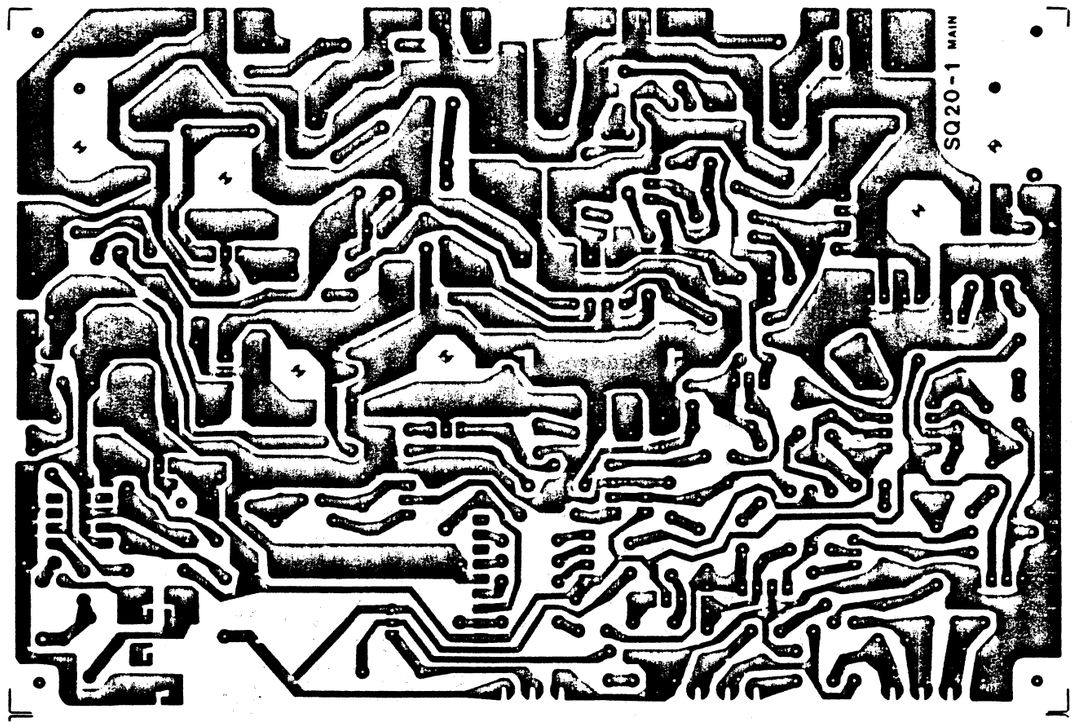
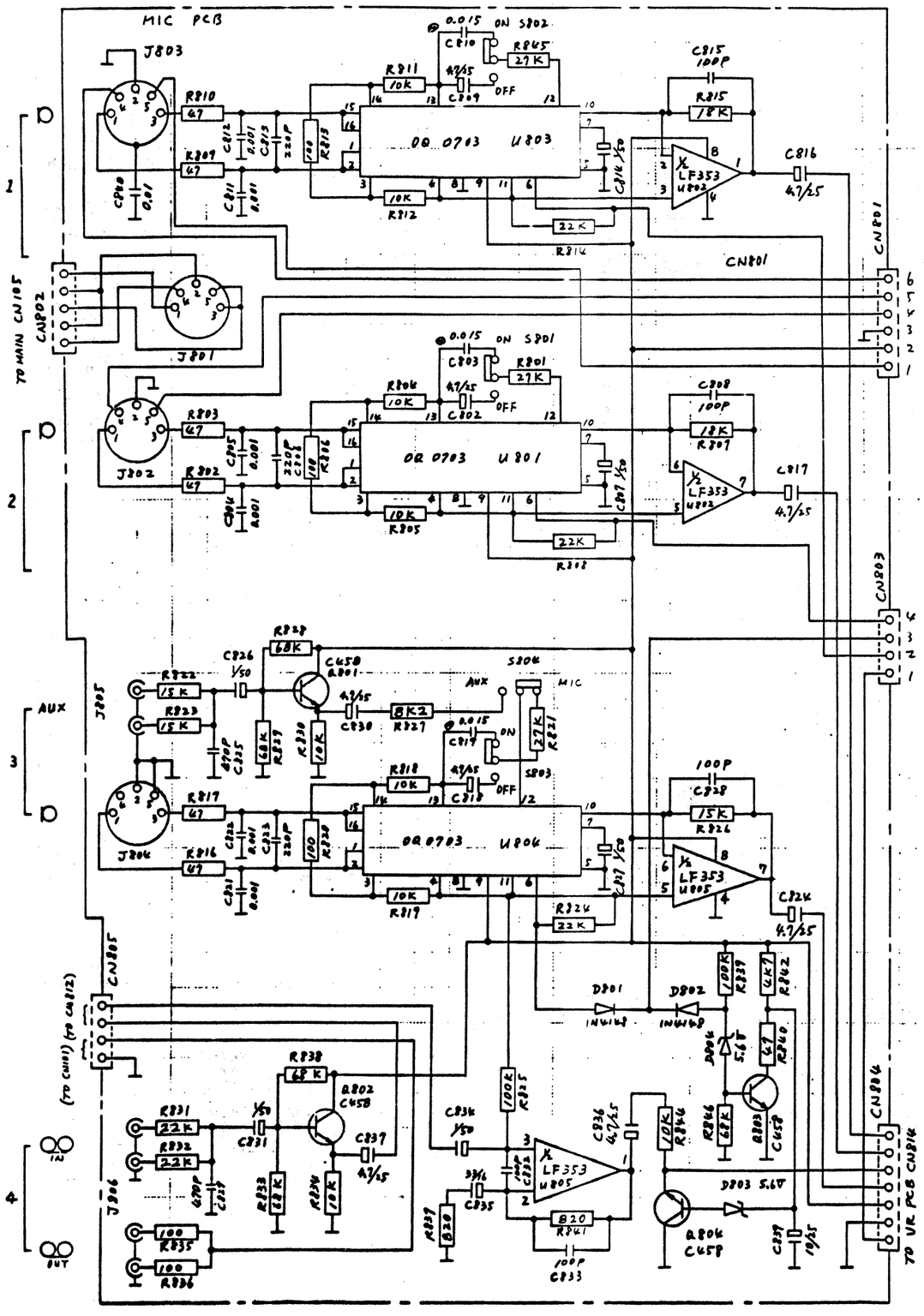
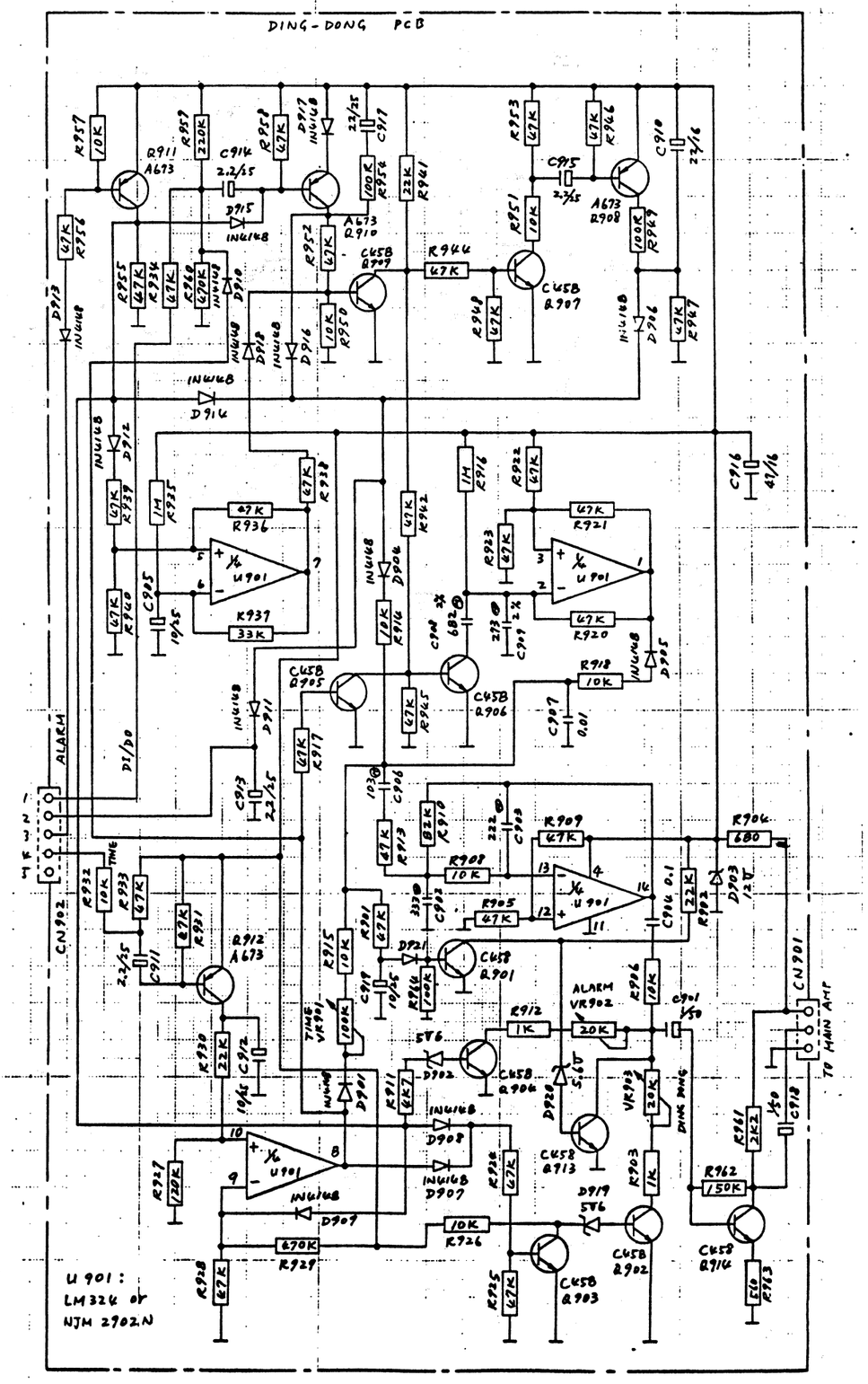


FIGURE 7.13
LBB 1234/1235
PCB LAY-OUT





Service Documentation 4822 733 24416

FIGURE 7.14
LBB 1237/1238
CIRCUIT DIAGRAM PART 1

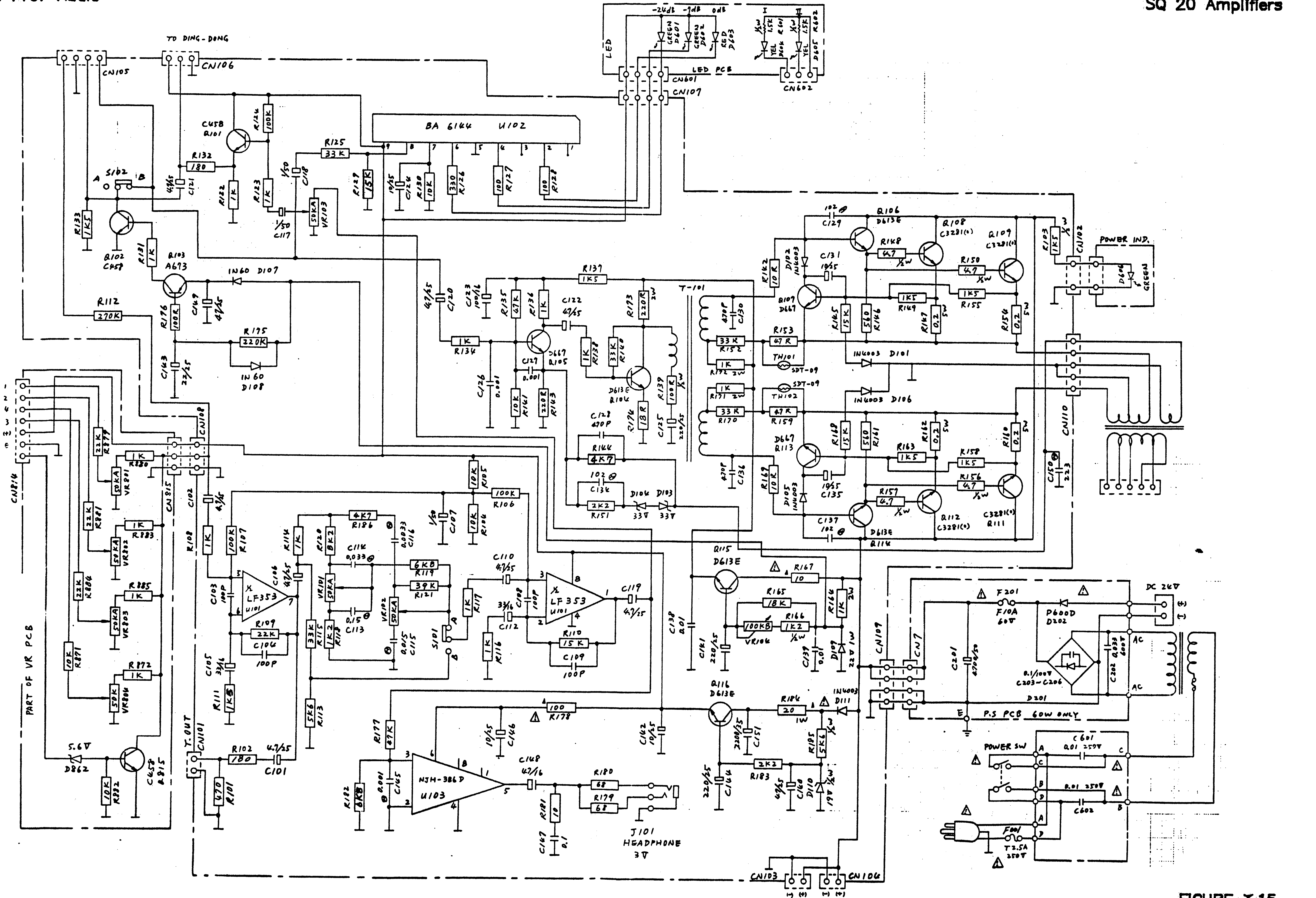

TO DING-DONG
CN105
CN106
CN107
CN601
CN602
LED PCB
LED
-24dB -9dB 0dB
GREEN D601
GREEN D602
RED D603
YEL D604
YEL D605
1.5K R601
1.5K R602
BA 6144 U102
C458 Q101
Q102 C458
Q103 A673
S102
R125 33K
R132 180
R112 270K
R175 220K
1N60 D107
1N60 D108
VR103 50KA
R137 1K5
T-101
D667 Q105
D613E Q104
Q106 D613E
Q107 D667
Q108 C3281(O)
Q109 C3281(O)
Q111 C3281(O)
Q112 C3281(O)
D667 Q113
D613E Q114
1N4003 D101
1N4003 D106
TH101 SDT-09
TH102 SDT-09
POWER IND.
D606 GREEN
CN102
CN110
CN814
CN815
CN108
PART OF VR PCB
VR801 50KA
VR802 50KA
VR803 50KA
VR804 50K
5.6V D862
C458 Q815
T.OUT CN101
½ LF353 U101
VR101 50KA
VR102 50KA
S101
R106 100K
R110 15K
Q115 D613E
Q116 D613E
VR104 100KB
NJM-386D U103
J101 HEADPHONE 3V
CN103
CN104
CN109
CN7
F201 F10A 60V
P600D D202
D201
DC 24V
AC
P.S PCB 60W ONLY
POWER SW
C601 0.01 250V
C602 0.01 250V
F001 T2.5A 250V

FIGURE 7.15
LBB 1237/1238
CIRCUIT DIAGRAM PART 2

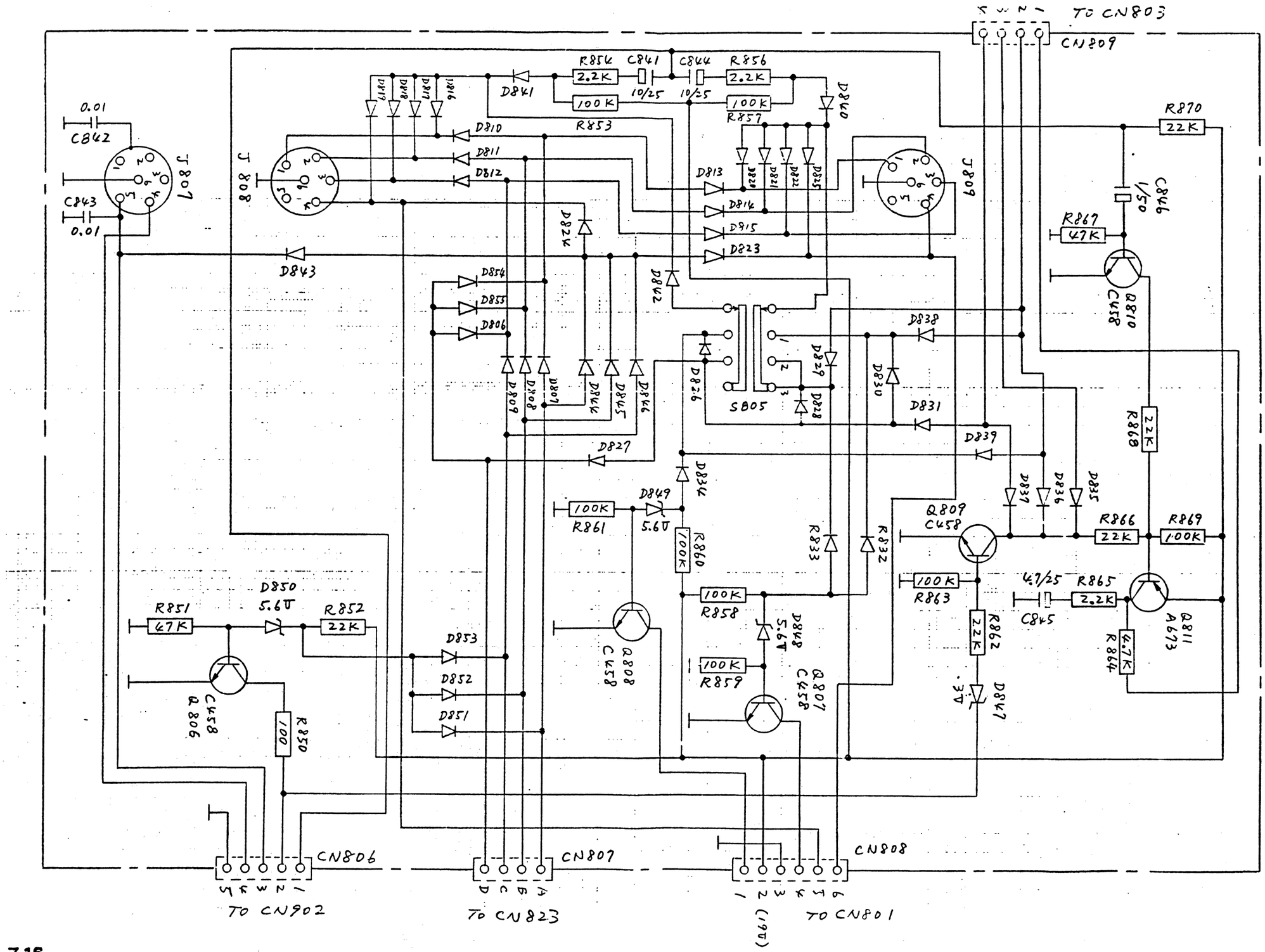


FIGURE 7.16
LBB 1237/1238
CIRCUIT DIAGRAM PART 3

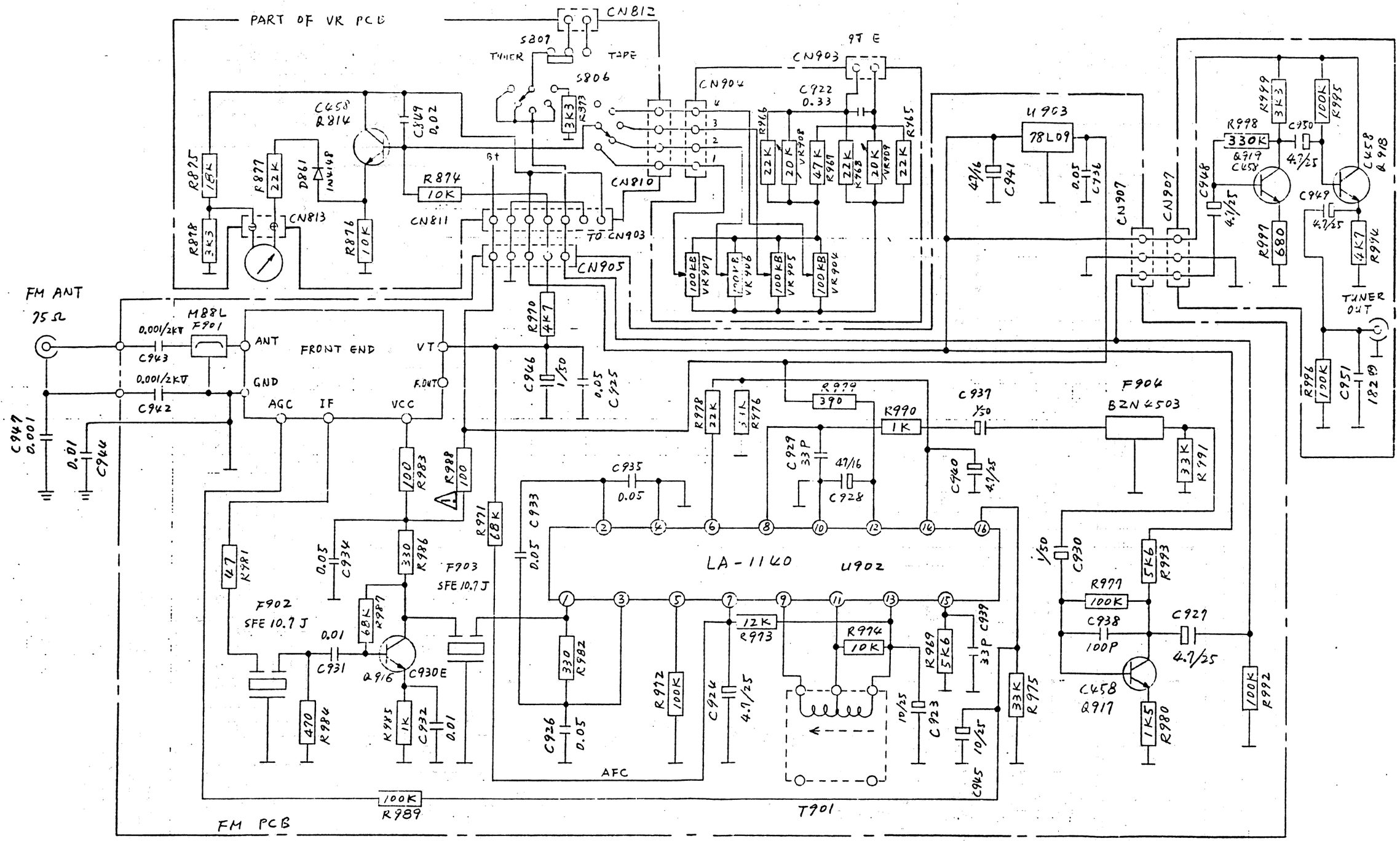


FIGURE 7.17
LBB 1237/12.38
CIRCUIT DIAGRAM PART 4

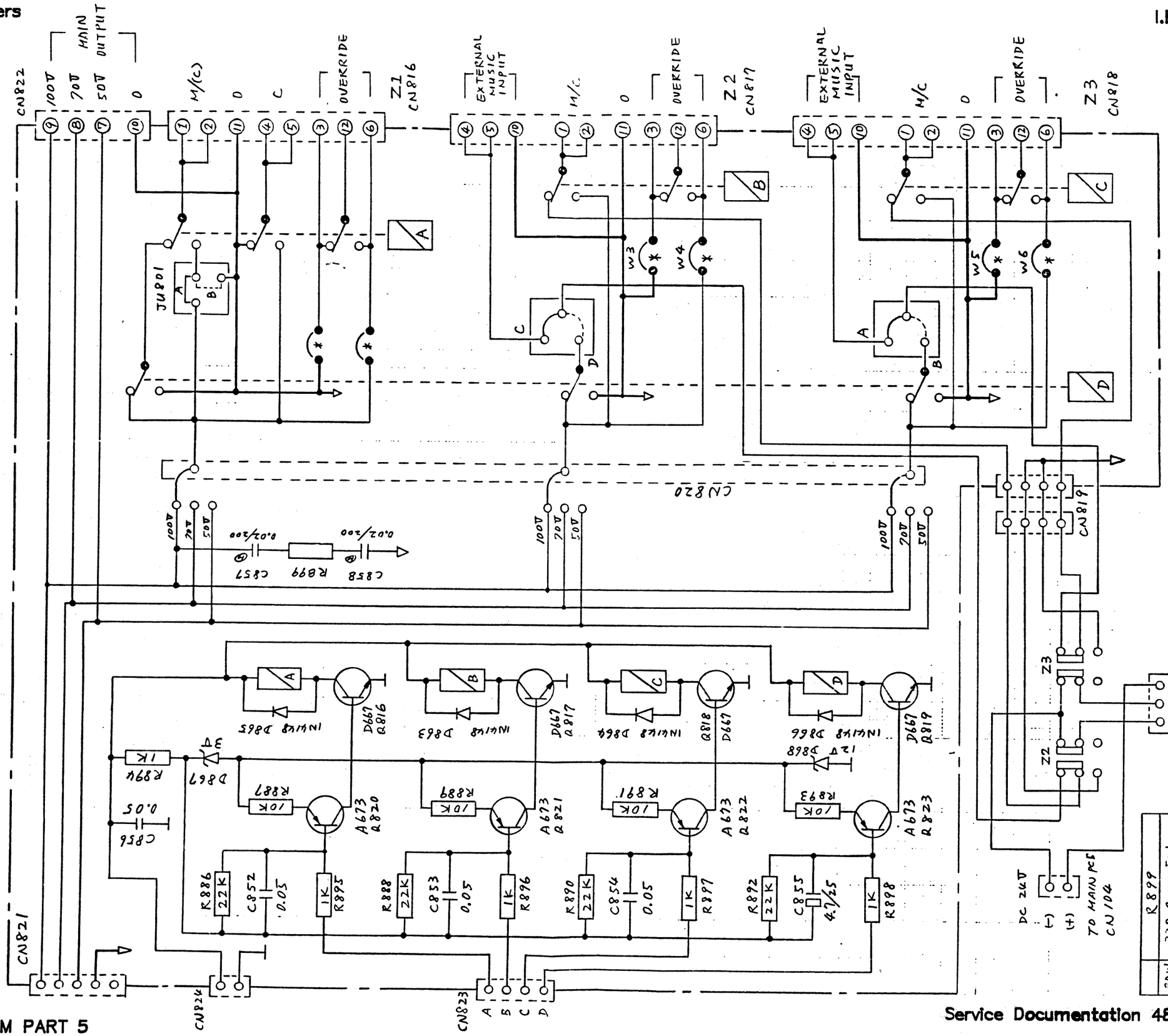
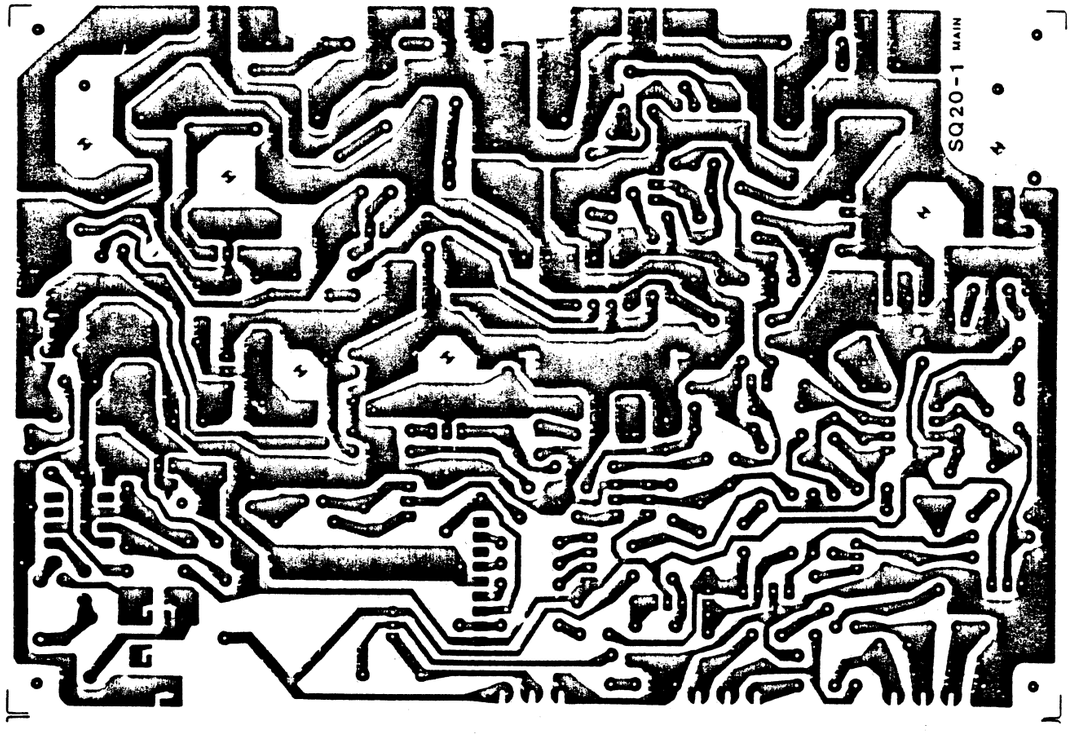


FIGURE 7.18
LBB 1237/1238
CIRCUIT DIAGRAM PART 5



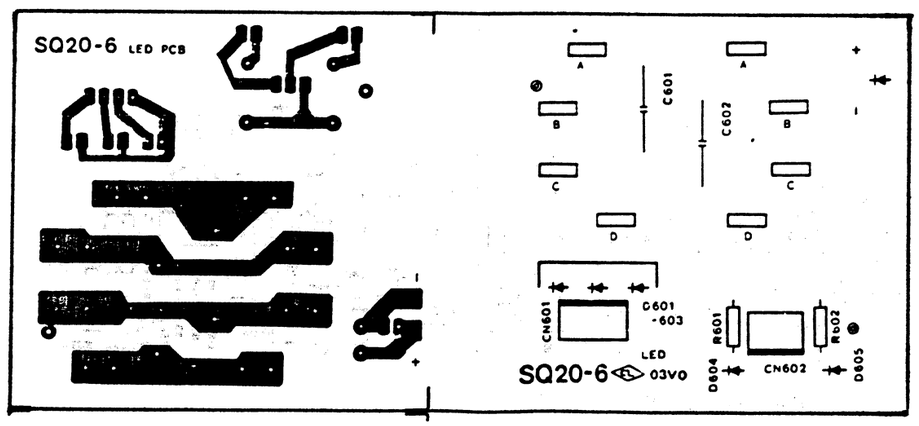
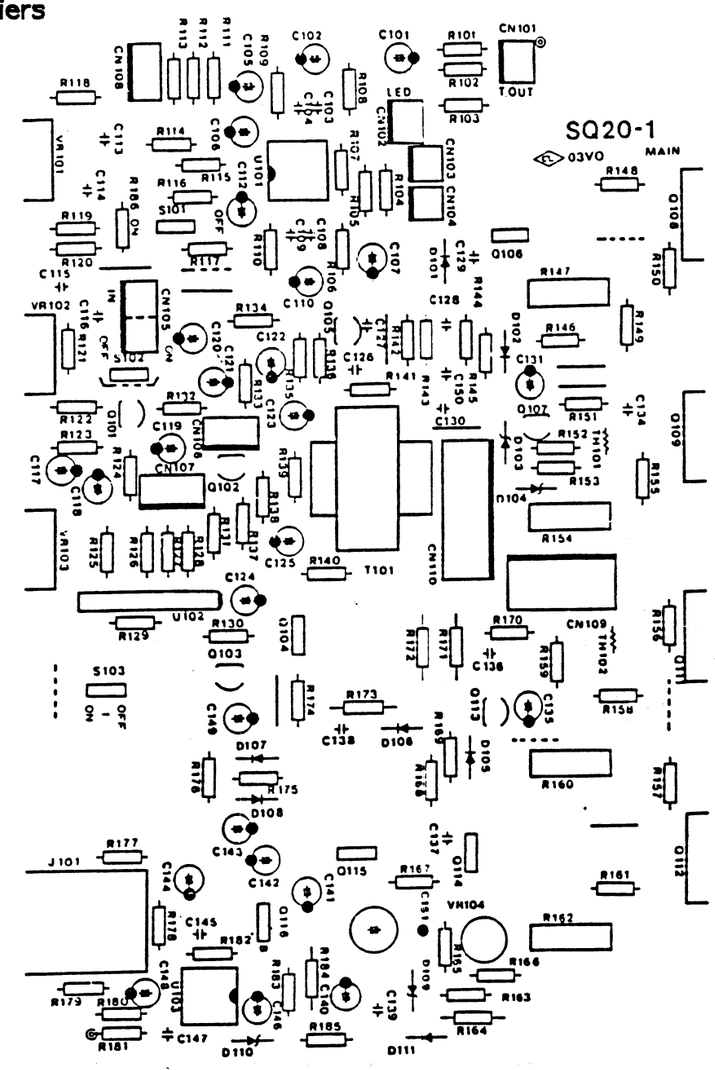
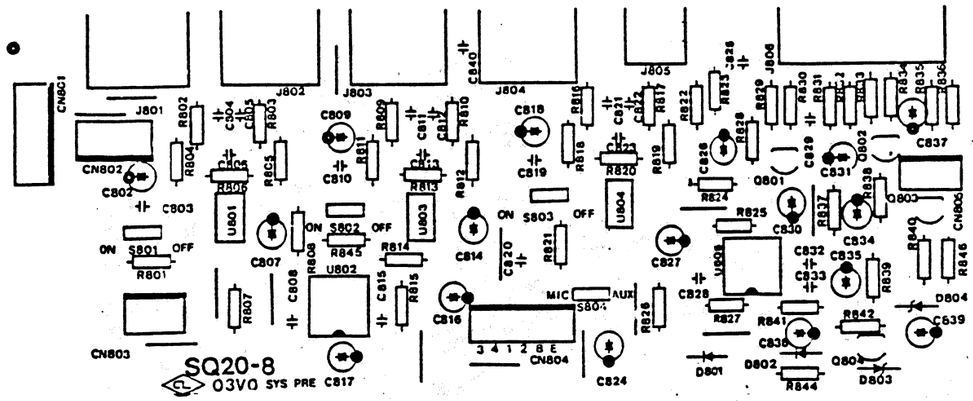
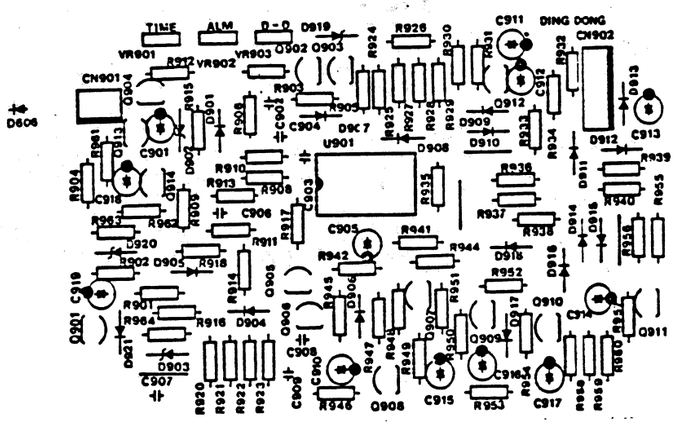


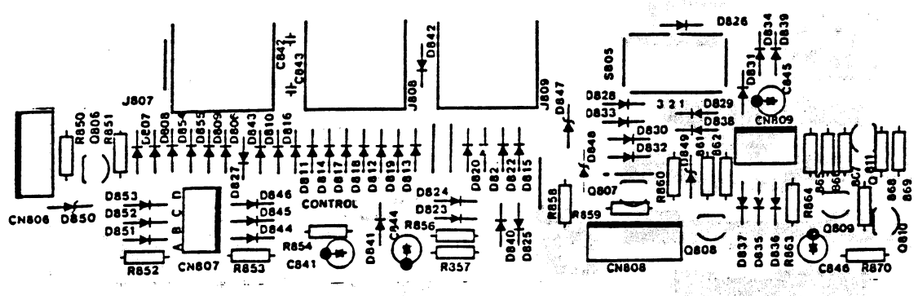
FIGURE 7.19
LBB 1237/1238
PCB LAY-OUT PART 1



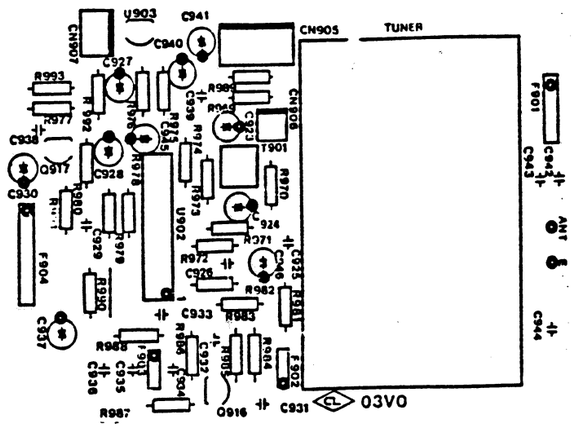




DING DONG PCB

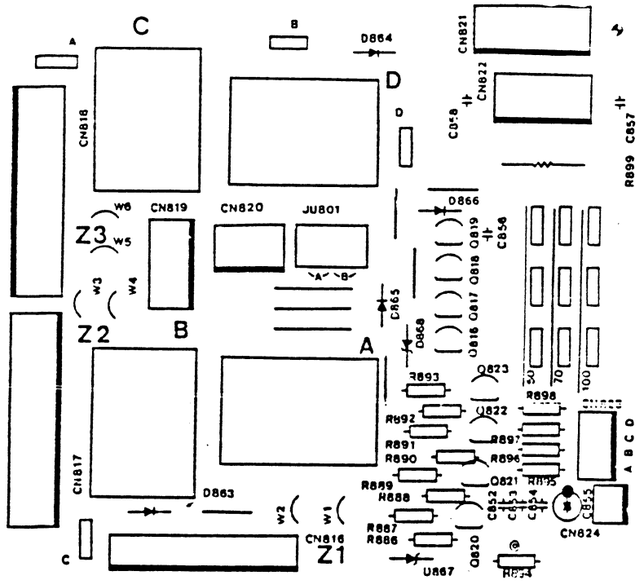


VOLUME PCB

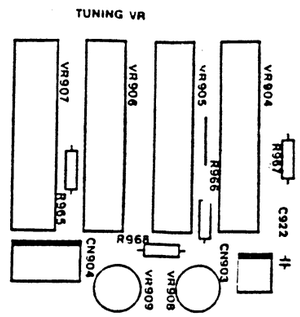


TUNER PCB

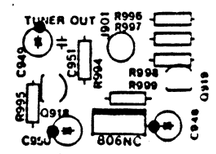
FIGURE 7.20
LBB 1237/1238
PCB LAY-OUT PART 2



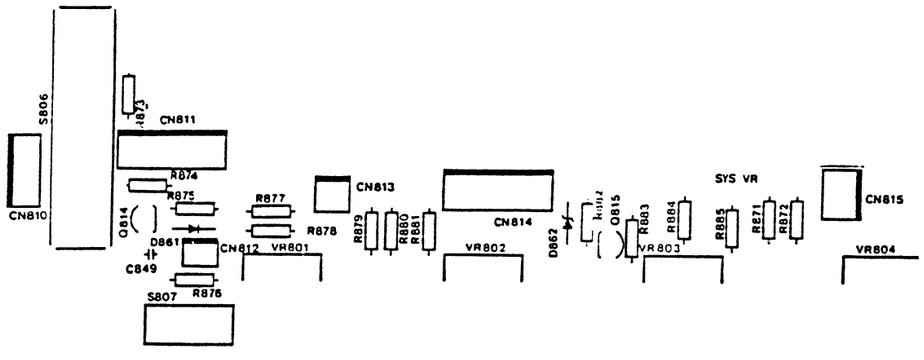
RELAIS PCB



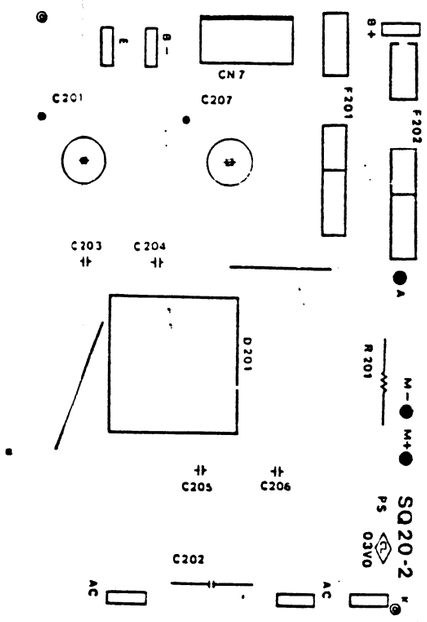
TUNER VR PCB

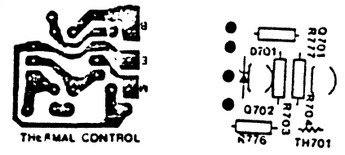


TUNER–OUT PCB



VOLUME PCB





ONLY VALID FOR LBB 1238

FIGURE 7.21
LBB 1237/1238
PCB LAY–OUT PART 3

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7.10 LBB 1231/00, LBB 1232/00, LBB 1233/00 PCB LAY-OUT \PART1

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7.14 LBB 1237/00, LBB 1238/00 CIRCUIT DIAGRAM \PART1

7.15 LBB 1237/00, LBB 1238/00 CIRCUIT DIAGRAM \PART2

7.16 LBB 1237/00, LBB 1238/00 CIRCUIT DIAGRAM \PART3

7.17 LBB 1237/00, LBB 1238/00 CIRCUIT DIAGRAM \PART4

7.18 LBB 1237/00, LBB 1238/00 CIRCUIT DIAGRAM \PART5

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7.20 LBB 1237/00, LBB 1238/00 PCB LAY-OUT \PART2

7.21 LBB 1237/00, LBB 1238/00 PCB LAY-OUT \PART3

1. CHAPTER 1. INTRODUCTION

1.1. GENERAL

The SQ20 range of high performance audio mixing, pre-mixing, booster and system amplifiers have been designed for use in a wide variety of Public Address environments. Ease of operation, combined with good service-accessibility have been optimised in their design.

The total SQ20 range comprises:

LBB 1229/00	Tuner-unit
LBB 1230/00	Pre-Mixing Amplifier
LBB 1231/00	30 Watt Mixing Amplifier
LBB 1232/00	60 Watt Mixing Amplifier
LBB 1233/00	120 Watt Mixing Amplifier
LBB 1234/00	60 Watt Booster Amplifier
LBB 1235/00	120 Watt Booster Amplifier
LBB 1237/00	60 Watt System Amplifier
LBB 1238/00	120 Watt System Amplifier
LBB 1239/00	Mounting-brackets

In this Manual the technical data, installation instructions, spare parts and diagrams of the complete SQ20 range as subscribed above are included, except the callstation(s).
The LBB 9427/10, and the new colour-item LBB 9527/10, are described within an additional manual.

Since, for some chapters, information has already been published within the "Datasheets", we will refer to these sheets.
For the SQ20 range, several "Datasheets" are available, combined with this documentation as figures 2.1 upto and including 2.4.

The aim of this Service Manual is mainly to provide in a "Selected component" Second Line Service, because of the ease of install and maintain.

1.2. THE SQ20 AMPLIFIER RANGE

See "Datasheets" . This range is enlarged with the SQ 20 - Cassette unit LBB 1228/00, and the Cassette player LBB 1228/50. The details of the LBB 1228/xx were not available at the moment this Service-manual was printed; the details will be published by a Service-Information.

2. TECHNICAL DATA

See the "Datasheets" , which are part of this service-manual, as figure 2.1 upto and including 2.4.

3. INSTALLATION

- **Opening the amplifier**

Access may be gained to the mains transformer tappings; d.c. fuses; and internally mounted "slide switches", "flying leads" and wire links, by removing the four cross-headed screws (two on each side of the amplifier), and removing the top cover.
Care should be taken not to lose the toothed shake-proof washers which are fitted under the heads of the screws. These washers are required to electrically bond the top cover to the earthed chassis of the amplifier.
For safety reasons these washers must always be fitted when the amplifier is in use.

Note: Before removing the cover, disconnect the amplifier from the mains supply. For safety reasons, it is NOT sufficient just to switch off the amplifier !

- **19" Rack Mounting**

The range of SQ20 system amplifiers have been designed for both table-top, or 19" rack mounting. Two mounting brackets (LBB 1239/00) and their associated screws, can be ordered for rack mounting the unit.

To attach the mounting brackets, first remove the top cover as described.
Locate the two screw holes provided at both sides of the

amplifier. Using the associated screws, firmly mount the brackets to the amplifier.

- **Mains connections and earthing**

The system amplifiers are supplied ready for use on 220 V a.c. mains. They are adjustable for use on 110 V, 127 V, 220V -230V and 240V by resoldering the brown wire onto the appropriate tag on the mains transformer (T), covered by a protective shield. Care should be taken to ensure that the wire is firmly soldered to the tag.

Note: The amplifier must be tapped for the correct mains voltage, as described, before connecting it to the mains supply.
On delivery the amplifier is supplied with a 2m long 3-core mains lead, terminated at one end with a 2 pole mains plug with earth contacts, and at the other end with a C.E.E connector. In some countries it may be necessary to replace the mains plug with one of a local standard type. A replacement plug must be wired as follows:

Earth - green/yellow
Neutral - blue
Live - brown

WARNING!:

This amplifier must be powered via an earthed mains outlet .

A non restoring thermal fuse, located in the mains transformer, will disconnect the mains supply, should the mains transformer overheat.

WARNING!:

This fusable link operates on the primary winding of the mains transformer, and although the mains indicator LED may be off the full mains supply voltage is still present inside the amplifier.

4 CHECKING AND ADJUSTING

See Instructions for use

NOTE: when replacing the tuner-module of both System-amplifier-models LBB 1237/00 and LBB 1238/00 following only, should be done: adjusting the scale between 88 and 108 MHz. Since this amplifier has been delivered before the moment, this manual was printed, a Service-information "TIP: TI099PA063" has been released regarding these amplifier-models LBB 1237/00 and LBB 1238/00. A brief content of this Service-information-sheet is that "in some system-amplifiers, a tuned signal will be overruled by another stronger signal; corrective action is the change of resistor R971 (68kOhm) into 220kOhm. From serial-number 001361 (LBB 1237/00), and 001441 (LBB 1238/00) onwards, this action already has been implemented.

5 CIRCUIT-DESCRIPTION

These amplifiers are repaired at so-called "selected component level", consequently the description would normally be at component-level. Since the technique of the amplifiers is rather simple, it has been decided not to make a complete full-filled description at component-level. The knowledge of the average workshop-engineer should be at this level.

NOTE: Additional details, which are relevant for the following type-numbers:

5.1 DIFFERENCE BETWEEN THE SEVERAL OUTPUT-STAGE'S:

AMPLIFIER-MODEL	30W	60W	120W
MIXING- LBB	1231/00	1232/00	1233/00
BOOSTER- LBB		1234/00	1235/00
SYSTEM- LBB		1237/00	1238/00

ITEM	30W	60W	120W	
R150, R156	----	----	4,7Ω	
R155, R158	----	----	1,5kΩ	
R149, R166	470Ω	1kΩ	1,5kΩ	
R144	4,7kΩ	5,6kΩ	5,6kΩ	
C201	4700uF	6800uF	4700uF	
C207	----	----	4700uF	
F201	F 5A	F 8A	F 10A	
F202	----	----	F 10A	
F001	T 1A	T 1,6A	T 2,5A	
R501	330Ω	180Ω	100Ω	ALL 5W

6 SPARE-PARTS

General:

The spare-parts, as indicated, are so-called "selected components", which means that only a number of the used components have been selected to be a spare-part, in order to reduce the number of obsolesce-risk. This means that, if one cannot repair the unit by using one of the possible components, one normally has to replace the amplifier!
The spare-parts are available from Philips Consumer Service.

The mentioned spare-parts, used within the several type's of the amplifier-range, are NOT listed as certain so-called 'pos.' - numbers, but as a type-number of the component, i.e. Q302 (transistor C458) is mentioned as "transistor C458 NPN with a 5322.. number", and NOT as "pos. Q302", with a 5322.. number.
No discrete components, like ordinary resistors and capacitors are mentioned, because of the assumption of the fact that one normally has components like these within a regular workshop.

NOTE: some items within this listing are mentioned as a component with Spare-part-number 0000 000 00000; this means this item will be available as a Spare-part, however at the moment, this Documentation was finished, this item did not have a Philips Consumer Service code-number yet. This information will be added to the Service Documentation, by means of a Service-Information-Sheet (Documentation Change) as soon as the necessary information is available.

6.1 RECOMMENDED SPARE-PARTS TOTAL SQ 20 SERIES:

Main switch	5322 277 11136
Tuner PCB	5322 214 11157
Power Supply transformer (LBB 1229/1230/00)	5322 146 10331
Mains connector	5322 265 30876
Battery connector	5322 265 30875
Set handles	5322 498 50319
VU-Meter	5322 344 50118
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode 1 N4148 (BAW 62)	4822 130 30613
Power-transistor C3281	4822 130 60116
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Operational amplifier LF 353	5322 209 81395
Operational amplifier LM 324	4822 209 80587
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Thermistor SDT 09	5322 116 30414
Mains transformer PT-SQ20-30W	5322 146 10329
Output transformer 30 W	5322 146 10327
Mains transformer PT-SQ20-60W	5322 146 10332
Output transformer 60 W	5322 146 10333
Mains transformer PT-SQ20-120W	5322 146 10334
Output transformer 120 W	5322 140 60332
Fan-motor	5322 361 10598
Tuner PCB (LBB 1229/1237/1238/00)	5322 214 11157
Fuses: F 0,5 A	4822 253 30017
T 0,5 A	4822 253 20014
T 1,0 A	4822 070 31002
T 1,6 A	4822 070 31602
T 2,0 A	4822 253 30025
T 2,5 A	4822 070 32502
T 3,15 A	4822 070 33152
F 5,0 A	5322 253 40055
T 5,0 A	4822 253 30029
F 8,0 A	5322 253 40034
F 10 A	5322 253 54035

6.2 SPARE-PARTS listed per type-number:

6.2.1 LBB 1229/00 SQ-20 TUNER-UNIT

Front panel	5322 447 50146
Knob	5322 414 30183
Main switch	5322 277 11136
Potentio-meter	5322 101 11138
Jack-plug	5322 265 20515
Phone jack	5322 267 10273
Fuse	5322 253 40055
Tuner PCB	5322 214 11157
Power Supply transformer	5322 146 10331
Mains connector	5322 265 30876
Battery connector	5322 265 30875
Set handles	5322 498 50319
VU-Meter	5322 344 50118
Tuner channel-selector switch	5322 210 10424
Loudspeaker	0000 000 00000
Potentiometer 100kΩ	0000 000 00000
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.2 LBB 1230/00 SQ-20 PRE-MIXING AMPLIFIER

Front panel	5322 447 50144
Knob	5322 414 30152
Knob	5322 414 30183
Main switch	5322 277 11136
Potentiometer RK163111A152	5322 101 11139
Potentiometer RK163111R376	5322 101 11138
Jack plug PJ-202NP	5322 265 20515
Phone Jack HTJ064-03	5322 267 10273
Fuses: F 0,5 A	4822 253 30017
T 1 A	4822 070 31002
T 0,5 A	4822 253 20014
DIN 5 pol DJ-005	5322 267 10272
Mains transformer PT SQ.20-PM	5322 146 10331
Mains connector 4300-1002	5322 265 30876
Battery-connection (incl. fuse) DT55A02W-02	5322 265 30875
Handle, 2 pcs. incl. screws	5322 498 50319
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.3 SPARE PARTS LBB 1231/00 SQ-20 30 W MIXING AMPLIFIER

Front panel	5322 447 50144
Knob 18	5322 414 30152
Knob 14	5322 414 30183
Main switch	5322 277 11136
Potentiometer A152	5322 101 11139
Potentiometer R376	5322 101 11138
Jack plug	5322 265 20515
5P DIN	5322 267 10272
Phone Jack	5322 267 10273
Fuses: F 5,0 A	5322 253 40055
T 2,0 A	4822 253 30025
T 1,0 A	4822 070 31002
Mains transformer PT-SQ20-30W	5322 146 10329
Mains connector	5322 265 30876
Battery conn. incl. fuse	5322 265 30875
Thermistor SDT 09	5322 116 30414
Output transformer 30 W	5322 146 10327
Handle 2pcs. incl. screws	5322 498 50319
Made-and-lock 6 pol.	5322 267 40995
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.4 SPARE PARTS LBB 1232/00 SQ-20 60 W MIXING AMPLIFIER

Front panel	5322 447 50144
Knob 18	5322 414 30152
Knob 14	5322 414 30183
Main switch	5322 277 11136
Potentiometer A152	5322 101 11139
Potentiometer R376	5322 101 11138
Jack plug	5322 265 20515
Phone JACK	5322 267 10273
5P DIN	5322 267 10272
Fuses: F 8,0 A	5322 253 40034
T 3,15 A	4822 070 33152
T 1,6 A	4822 070 31602
Mains transformer 60 W	5322 146 10332
Mains connector	5322 265 30876
Battery conn. incl. fuse	5322 265 30875
Thermistor SDT 09	5322 116 30414
Output transformer 60 W	5322 146 10333
Handle 2pcs. incl. screws	5322 498 50319
Made-and-lock 6 pol.	5322 267 40995
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.5 SPARE PARTS LBB 1233/00 SQ-20 120 W MIXING AMPLIFIER

Front panel	5322 447 50144
Knob 18	5322 414 30152
Knob 14	5322 414 30183
Main switch	5322 277 11136
Potentiometer	5322 101 11139
Potentiometer Switch	5322 101 11138
Jack plug	5322 265 20515
Phone jack	5322 267 10273
5P DIN	5322 267 10272
Fuses: F 10 A	5322 253 54035
T 5,0 A	4822 253 30029
T 2,5 A	4822 070 32502
Mains transformer 120 W	5322 146 10334
Mains connector	5322 265 30876
Battery conn. incl. fuse	5322 265 30875
Fan-motor	5322 361 10598
Thermistor SDT 09	5322 116 30414
Output transformer 120 W	5322 140 60332
Handle 2pcs. incl. screws	5322 498 50319
Made-and-lock 6 pol.	5322 267 40995
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.6 SPARE PARTS LBB 1234/00 SQ-20 60 W BOOSTER AMPLIFIER

Front panel	5322 447 50143
Knob 18	5322 414 30152
Jack-plug	5322 265 20515
Phone Jack	5322 267 10273
5P DIN	5322 267 10272
Main switch	5322 277 11136
Handle (2 pcs. incl. screws)	5322 498 50319
Made-and-lock 6 pol.	5322 267 40995
Mains connector, incl fuse	5322 265 30876
Battery conn. incl. fuse	5322 265 30875
Fuses: F 8,0 A	5322 253 40034
T 3,15 A	4822 070 33152
T 1,6 A	4822 070 31602
Mains transformer 60 W	5322 146 10332
Output transformer 60 W	5322 146 10333
Thermistor SDT 09	5322 116 30414
Potentiometer	5322 101 11138
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.7 SPARE PARTS LBB 1235/00 SQ-20 120 W BOOSTER AMPLIFIER

Front panel	5322 447 50143
Knob 18	5322 414 30152
Jack-plug	5322 265 20515
Phone Jack	5322 267 10273
5P DIN	5322 267 10272
Main switch	5322 277 11136
Handle (2 pcs. incl. screws)	5322 498 50319
Made-and-lock 6 pol.	5322 267 40995
Mains connector, incl fuse	5322 265 30876
Battery conn. incl. fuse	5322 265 30875
Fuses: F 10 A	5322 253 54035
T 5,0 A	4833 253 30029
T 2,5 A	4822 070 32502
Fan-motor	5322 361 10598
Mains transformer 120 W	5322 146 10334
Output transformer 120 W	5322 140 60332
Thermistor SDT 09	5322 116 30414
Potentiometer	5322 101 11138
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Operational amplifier LF 353	5322 209 81395
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613

6.2.8 SPARE PARTS LBB 1237/00 SQ-20 60 W SYSTEM AMPLIFIER

Front panel	5322 447 50145
Knob 18	5322 414 30152
Knob 14	5322 414 30183
Knob 10 x 7	5322 414 20393
Phone Jack	5322 267 10273
Jack-plug 2 pol.	5322 265 20515
Jack 4 pol.	5322 265 20517
DIN 5 pol.	5322 267 10272
DIN 6 pol.	5322 267 10275
Main switch	5322 277 11136
Handle (2 pcs. incl. screws)	5322 498 50319
Made-and-lock 9 pol.	5322 267 40999
Made-and-lock 12 pol.	5322 267 41001
Mains connector, incl fuse	5322 265 30876
Fuses: F 8,0 A	5322 253 40034
T 3,15 A	4822 070 33152
T 1,6 A	4822 070 31602
Mains transformer 60 W	5322 146 10332
Output transformer 60 W	5322 146 10333
Tuner channel selector	5322 210 10424
Battery conn. (incl. fuse)	5322 265 30875
Moving coil-meter	5322 344 50118
Relais 2 pol.	5322 280 20483
Relais 4 pol.	5322 280 20484
Potentiometer A152	5322 101 11139
Potentiometer A376	5322 101 11144
Thermistor SDT 09	5322 116 30414
Zone switch 2 channel	5322 276 20512
Switch tuner/tape	5322 277 21507
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Operational amplifier LF 353	5322 209 81395
Operational amplifier LM 324	4822 209 80587
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458

SPARE PARTS LBB 1237/00 SQ-20 60 W SYSTEM AMPLIFIER (Cont'd)

Diode 1 N 60 Germanium	4822 130 80562
Diode D 810	5322 130 82564
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613
Tunermodule , (incl. conn.)	5322 214 11157
Aerial plug assy (incl. filling pcs.)	5322 264 30317

6.2.9 SPARE PARTS LBB 1238/00 SQ-20 120 W SYSTEM AMPLIFIER

Front panel	5322 447 50145
Knob 18	5322 414 30152
Knob 14	5322 414 30183
Knob 10 x 7	5322 414 20393
Jack-plug	5322 265 20515
Jack	5322 265 20517
DIN 5 pol.	5322 267 10272
DIN 6 pol.	5322 267 10275
Main switch	5322 277 11136
Handle (2 pcs. incl. screws)	5322 498 50319
Made-and-lock 9 pol.	5322 267 40999
Made-and-lock 12 pol.	5322 267 41001
Mains connector, incl fuse	5322 265 30876
Fuses: F 10 A	5322 253 54035
T 5,0 A	4822 253 30029
T 2,5 A	4822 070 32502
Fan-motor	5322 361 10598
Mains transformer 120 W	5322 146 10334
Output transformer 120 W	5322 140 60332
Tuner channel selector	5322 210 10424
Battery conn. (incl. fuse)	5322 265 30875
Moving coil-meter	5322 344 50118
Relais 2 pol.	5322 280 20483
Relais 4 pol.	5322 280 20484
Potentiometer A152	5322 101 11139
Potentiometer A376	5322 101 11144

SPARE PARTS LBB 1238/00 SQ-20 120 W SYSTEM AMPLIFIER (Cont'd)

Thermistor SDT 09	5322 116 30414
Zone switch 2 channel	5322 276 20512
Switch tuner/tape	5322 277 21507
Transistor C485 NPN	5322 130 62667
Transistor A673 PNP	4822 130 41412
Transistor D613E NPN	5322 146 10328
Transistor D667 NPN	5322 146 10329
Power-transistor C3281	4822 130 60116
Pre-amplifier integrated circuit OQ 0703	5322 209 63972
Operational amplifier LF 353	5322 209 81395
Operational amplifier LM 324	4822 209 80587
Integrated circuit BA 6144	4822 209 73037
Integrated circuit NJM 386 D	5322 209 72458
Diode 1 N 60 Germanium	4822 130 80562
Diode D 810	5322 130 82564
Diode D 1502	5322 130 82533
Diode 1 N4148 (BAW 62)	4822 130 30613
Tunermodule , (incl. conn.)	5322 214 11157
Aerial plug assy (incl. filling pcs.)	5322 264 30317